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Investigated were factors influencing science achievement at the college level of 1,191 students who graduated from 12 midwestern high schools in 1963. Factors investigated included interest, intelligence, high school achievement, and family background. Data sources included secondary school standardized tests, college transcripts, Kuder Preference Records completed during freshman and junior college years, and questionnaires completed during sophomore and junior years. Student IQ and the belief that the parents thought education important, related most significantly to achievement. Success was not related to either the size of the high school or the size of the college attended, and students of the same IQ received substantially the same grades in one type of institution of higher education as they did in another. (GR)

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February 1969

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February 1969

This research reported herein was performed pursuant to a contract with the Office of Education, U. S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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Assistance in maintaining contacts with the participants was provided by the administrators of the school systems in Archbold and Bryan, Ohio; Angola, Elkhart and Kendallville, Indiana; Kankakee, Rockford and Wilmington, Illinois; and Kalamazoo, Marshall and Quincy, Michigan. Without access to their records to identify the college-bound students, the maintenance of a roster of participants would have been extremely difficult.

Special thanks are due also to the many colleges that provided transcripts for this study, to the many secretaries who handled mountains of correspondence, and, of course, to the participants whose continued cooperation in providing data made this study possible.

George G Mallinson

George G. Mallinson
Principal Investigator

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SUMMARY

The purpose of this study was to investigate the collegiate experiences, with particular reference to achievement in courses in science, of 1,191 students who graduated from high school in June 1963 in 12 Midwestern high schools. The students were members of a group of over 6,000 participants in a science motivation study conducted from 1957-63. The study reported herein was designed to determine the extent to which factors such as interest, intelligence, high-school achievement, and family background might be related to the election of, and success in, college science courses.

Four primary sources of data were used for this study: (1) a reanalysis of scores on standardized tests administered to the participants when they were in secondary school; (2) college transcripts; (3) *Kuder Preference Records* completed by the participants during their freshman and junior years of college; and (4) questionnaires to which they responded during their sophomore and senior years. The data thus collected were used also to compare the college students with a group of their non-college-bound peers.

The findings indicate that, as was expected, the college students differed from their non-college-bound peers in that they had higher I.Q.'s; came from homes of higher socio-economic level; and had parents with higher aspirations for the education of their children.

Of the total group entering college, about 85% enrolled immediately following high-school graduation, the vast majority in large state-supported institutions. Of the 849 who had received a bachelor's degree by February 15, 1968, 71% graduated from state-supported institutions.

The two most significant factors related to overall achievement in college were the student's I.Q. and his belief that his parents thought education was important. With respect to the election of, and achievement in, science courses an influential factor, in addition to the two above, was the number of science courses taken in high school. Interest in science, as indicated by the *Kuder Preference Record* during college seemed to have little influence, since many of those who majored in science did not evidence interest on the test.

Success in college was not found to be related to either the size of the high school from which a student graduated or the size of the college he attended. Students with the same I.Q. received substantially the same grades in one type of institution of higher education as they did in another.

CHAPTER I

INTRODUCTION

Background of the Study

In 1957 the principal investigator initiated a long-range study referred to as Science Motivation Project I that was designed to investigate the factors related to the achievements of students in courses in science in junior- and senior-high school; and the factors that motivate students to elect courses in science at these levels. The study was supported by the Office of Education as Project No. 503 and was officially entitled, An Analysis of the Factors Related to the Motivation and Achievement of Students in Science Courses in the Junior and Senior High Schools. The study was begun in 1957 with approximately 2,500 students completing the sixth grade in that year in school systems representing rural, semi-urban, and urban environments in the states of Illinois, Indiana, Ohio and Michigan. These school systems included Rockford, Kankakee, and Wilmington, Illinois; Angola, Elkhart, and Kendallville, Indiana; Archbold and Bryan, Ohio; Kalamazoo, Marshall, and Quincy, Michigan; and the University High School at Western Michigan University.

The original group of 2,500 was supplemented with other students who entered the eighth grades in the various schools in the fall of 1958, as well as with those who became members of these classes during the ensuing years. The study terminated in June 1963 when the classes involved graduated from high school.

Data for Science Motivation Project I were obtained from these sources:

1. Tests administered to the students during the Project including various measures of ability, interest and aptitude, as well as of science and mathematics achievement.

2. Analyses of the subject-matter backgrounds in science and mathematics, both graduate and undergraduate, of the science teachers of these students.

3. Scores from the administration of the Personal Audit to the science teachers in the 7th, 8th, and 9th grades.

4. Numerous interviews and observations within the communities of the participating school systems.

The tests that were regularly administered during the course of the project are found on the next page. In addition, special achievement tests in science were administered where appropriate. The data from all these sources were punched into IBM cards and analyses were made, using appropriate statistical techniques, to obtain answers to the questions posed in the Project. The numbers of students participating from each of these school systems are shown below:

School System	No. of Students
Angola	192
Archbold	78
Bryan	178
Elkhart	736
Kalamazoo	1,153
Kankakee	537
Kendallville	218
Marshall	279
Quincy	155
Rockford	2,207
University High	101
Wilmington	182
	6,016

When the data from Science Motivation Project I, hereinafter referred to as "SMP I", were analyzed, it was evident that marked differences existed between those students who planned to enter college after graduation from high school, and those who dropped out of high school before graduation or entered occupations or vocational schools after graduation. Hence, it was decided to carry out two concurrent studies that would extend the findings of SMP I. The study reported here, and referred to as "SMP II", was designed to collect information about the participants in SMP I who entered college. The corollary study, referred to as "SMP III", was designed to collect information about those students from the original study who did not enter college. The results of SMP III appear in the Final Report of Office of Education Project No. 5-0142, entitled *Characteristics of Non-College Vocationally-Oriented School Leavers and Graduates* that was submitted in February 1968. It was believed that, using the vast pool of data collected during SMP I as a base, answers to the questions posed in that study could be validated with information obtained after the participants had left high school. In addition, the information collected for SMP II would provide answers to the questions that appear

Table 1

The Testing Program for Science Motivation Project I

Year	Intelligence Tests	Reading Tests	Interest Tests and Inventories	Achievement Tests
1957-58	SRA Primary Mental Abilities: Intermediate Form		SRA Junior Inventory: Form AH	SRA Achievement Series: Science Part I (1958) and Science Part II (1958) SRA Achievement Series: Arithmetic (Grades 6-9)
1958-59		Diagnostic Reading Test: Form A	SRA Junior Inventory: Form AH	SRA Achievement Series: Science Part I (1958) and Science Part II (1959) SRA Achievement Series: Arithmetic (Grades 6-9)
1959-60	SRA Primary Mental Abilities: Intermediate Form		Your Educational Plans	SRA Achievement Series: Science Part I (1958) and Science Part II (1959) SRA Achievement Series: Arithmetic (Grades 6-9) Nelson Biology Test
1960-61			Kuder Preference Record: Form C	Nelson Biology Test Tests for General Physical Science
1961-62	SRA Tests of Educational Ability: Grades 9-12		Kuder Preference Record: Form C	ACS-NSTA Chemistry Test (1961)
1962-63		Diagnostic Reading Test: Form A	Kuder Preference Record: Form C	Dunning Physics Test

later, and certain significant comparisons could be made between the characteristics of the college and non-college groups.

Related Information

Since the "post-Sputnik" hysteria that beset American education, many studies have been undertaken concerning the problems of scientific manpower in the United States, as well as in foreign countries. Most of these studies have been designed to (1) identify factors related to "scientific aptitude," (2) discover trends in enrollments in different college curricula, (3) find ways of recruiting "abler students" to enter careers in science and mathematics, and/or (4) improve programs of instruction in science and mathematics at all levels. Among such studies are the following:

1. A Fact Book on Higher Education. First issue, 1968: Enrollment Data. American Council on Education, 1785 Massachusetts Avenue, N.W., Washington, D. C., 20036. Pp. 8001-8056.

2. Bachelor's Degrees in Science and Mathematics Expected for 1961-62 and Junior-Year Enrollments in Science, Mathematics, and Foreign Languages. OE-54021-62, Office of Education, U. S. Department of Health, Education, and Welfare, Washington, D. C., June 1962 (unpaged).

3. Berkner, L. V., "Whither Graduate Education." Physics Today, XVI (July 1963), 24-32.

4. College Entrance Examination Board, College Board Scores, No. 1 and College Board Scores, No. 2. Educational Testing Service, 1957 and 1958. Pp. 37-43, 113-9.

5. Edgerton, Harold A., Impacts of the National Science Foundation's Summer Science Program for High Ability Secondary School Students. Richardson, Bellows, Henry and Company, Inc., 355 Lexington Avenue, New York 16, New York, 1961. Pp. 141.

6. Flanagan, John C., et al., Project TALENT, The Identification, Development, and Utilization of Human Talents: The American High-School Student. Final Report for Cooperative Research Project No. 635. Pittsburgh: Project TALENT Office, University of Pittsburgh, 1964.

7. Investing in Scientific Progress 1961-1970: Concepts, Goals, and Projections. National Science Foundation, Washington, D. C., 1961. Pp. 30.

8. Mallinson, George G., (Chairman), *Science Programs in the State-Supported Institutions of Higher Education in Michigan*. A Report to the Michigan Council of State College Presidents by the Science Study Committee. Published at Western Michigan University, Kalamazoo, Michigan, May 1960. Pp. 79.

9. Mallinson, George G., *Final Report on Science Motivation Project I, Cooperative Research Project No. 503: An Analysis of the Factors Related to the Motivation and Achievement of Students in Science Courses in the Junior and Senior High Schools*. Cooperative Research Branch, Office of Education, U. S. Department of Health, Education, and Welfare, Washington, D. C., 1965. Pp. xviii + 177 + v.

10. Pelz, Donald C., "Social Factors in the Motivation of Engineers and Scientists." *School Science and Mathematics*, LVIII (June 1958), 417-29.

11. *Scientific Manpower 1960*. Papers of the Ninth Conference on Scientific Manpower, Symposium on Sociology and Psychology of Scientists. NSF 61-34, National Science Foundation, Washington, D. C. Pp. v + 52.

12. *Special Report on Five-Year Trend in Graduate Enrollment and Ph.D. Output in Scientific Fields at 100 Leading Institutions, 1959-60 to 1963-64*. Resources for Medical Research Report No. 6, June 1965. Public Health Service, U. S. Department of Health, Education, and Welfare, Washington, D. C., 20420, 1965.

13. Taylor, Calvin W., (ed.), *Research Conference on the Identification of Creative Scientific Talent*. Salt Lake City: University of Utah Press, 1959. Pp. 334.

14. *The Dynamics of Academic Science*. NSF 67-6, National Science Foundation, Washington, D. C., January 1967. Pp. xii + 190.

15. Tucker, Allan, Gottlieb, David, and Pease, John, *Attrition of Graduate Students at the Ph.D. Level in the Traditional Arts and Sciences*. Final Report of Cooperative Research Project No. 1146 entitled "Factors Related to Attrition Among Doctoral Students." Publication No. 8, 1964, Office of Research and Development and the Graduate School, Michigan State University, East Lansing, Michigan, 1964. Pp. 296.

In essence, these studies indicate that in the post-Sputnik era, enrollments in science and mathematics increased, with some decline in engineering. However, none of the studies revealed any convincing evidence that there is a single matrix of factors that can be identified as "scientific aptitude." Many of the studies suggested that creative ability in science and mathematics may be found in individuals who do not have "superior" mental abilities as evidenced on tests.

In undertaking SMP I, the investigator challenged many of the commonly-held ideas about "scientific aptitude." In particular, there seemed to be little evidence that the shortage of scientific personnel was likely to be alleviated in the near future. The main reasons were (1) the low birthrate between 1930 and 1946, as evidenced in the table that follows, and (2) the great increase in the birthrate since 1946.

College-Age Population by Year*

Year	Number
1939	8,700,000
1953	5,400,000
1961	8,700,000

*These data are abstracted from information collected by the Department of Defense and include persons in the 17-21 age range.

The data in the table are particularly significant in that the total population in 1939 was about 130 million and in 1961, about 180 million.

In general, a college-age population becomes stabilized in the occupational matrix in about 10 years. Thus, in 1949, the 1939 group had a college-age group to serve somewhat smaller than itself. However, from this year on, the population of the college-age group reached the nadir of about 5,400,000. Meanwhile the birthrate increased steadily until in 1961 the college-age group reached about the same number as in 1939. The ratio of that service population to the new consuming population was 1 to 1.6. As a result, there has been a desperate scramble for trained personnel in all areas, particularly in science.

By the time the 1961-65 college population has stabilized in the occupational matrix, in about 1972, the 8,700,000 people will have to serve 14,600,000 students of college age. The ratio will then be 1 to 1.7, which is less advantageous than the 1 to 1.6. Extrapolations of these data, together with the increasing need for scientific and technological personnel suggest that the problem of the 1960's will continue at least into the 1980's. Obviously, the need for better use of manpower resources continues to increase, rather than decrease.

Many factors related to the problems of scientific training and manpower were investigated in SMP I. That study differed from others in that it was longitudinal in nature, not retrospective, and was concerned with an analysis of students at all levels of ability.

Some of the more cogent findings from that longitudinal study that have implications for the study with which this report is concerned are these:

1. There was little evidence to show that gains in factual knowledge in science were accompanied with commensurate gains in the ability to make use of, or interpret, the concepts related to that knowledge.

2. It appeared that there were many factors related to science achievement at the secondary-school level. No single factor was shown to be so influential as to negate the importance of others. A matrix of many factors seemed to be responsible for the overall achievement of students.

3. Science achievement, either in terms of factual knowledge or conceptual understanding, was found to be only moderately related to mental ability. Factors other than intelligence seemed to have a much greater relationship; among such factors was that of reading ability, particularly level of reading comprehension.

4. At the ninth-grade level, students do not exhibit realistic attitudes toward future educational and/or occupational plans. That is, students with low ability and low achievement often aspire to college at this grade level; and vice versa. Thus, the wisdom of counseling students into, or out of, pre-college courses at the ninth-grade level is questionable.

5. No specific patterns of interest emerged from this study. That is, the high science achievers did not exhibit high interest in the Scientific area on the test used.

6. The one single factor revealed by the study that appeared to be most influential in stimulating science achievement was the level of aspiration and interest of the parents for the education of their children.

The Problem

As a result of the findings from SMP I, and because of the need for meaningful data related to the problems of scientific training and manpower, this study -- SMP II -- was undertaken with those students from SMP I who entered college. An effort was made to determine to what extent (1) factors such as reading ability, intelligence, interest, and science achievement, investigated during SMP I might be related to the later election of, and success in, science courses in college, and (2) the backgrounds of the secondary-school science teachers of these students may be related to the students' election of, and success in, courses in college science.

Specifically, it was hoped that a reanalysis of SMP I data, together with a comparison of the data collected for SMP II and SMP III might elicit answers to the following questions:

1. To what extent are the achievements of students in various courses in junior- and senior-high-school science related to the election of, and success in, courses in college science?

2. What factors of mental ability are related to the election of, and success in, courses in college science?

3. What matrices of interest evidenced in the secondary school are related to the election of, and success in, courses in college science?

4. What factors in family, and socio-economic, backgrounds may be related to the election of, and success in, courses in college science?

5. What differences exist between the characteristics of those students who major in science in college and those who do not?

6. What differences in characteristics exist between those students who participated in the Science Motivation Project and entered college, and those who did not enter college?

The methods employed in this study, and the findings of the investigation are reported in subsequent chapters of this report.

CHAPTER II

METHODS EMPLOYED

Purpose

The purpose of this chapter is to describe the methods employed in (1) reanalyzing the pool of data concerning the backgrounds of the participants, collected during Science Motivation Project I; (2) identifying the college-bound students who participated in SMP I; and (3) collecting data for this study.

Reanalysis of Data from Science Motivation Project I

The standardized tests that were administered to the participants in SMP I during the period 1957-1963 are listed in Table 1, p. 4. Since all the scores were punched in IBM cards, reanalysis of the data for use in this study was relatively easy. The major step taken was to place the data in disc storage for more rapid access. The specific analyses made will be described where appropriate with the findings and conclusions in later chapters.

Identifying the Subjects for the Study

The first step in implementing this study, or SMP II, was to identify those participants in SMP I who professed that they planned to enter college following graduation from high school. For most of the students, this meant entering college in the Fall 1963.

During the Spring 1963, the principal investigator, together with one or more assistants, visited all the SMP I schools listed on p. 3. With the cooperation of the school administrators, special assembly programs involving all seniors were arranged. At the programs, the principal investigator explained the scope of SMP I, as well as the proposed plans for SMP II. It might be noted that this was the first time that some of the participants were aware of their participation throughout the six years of SMP I. In addition to explaining the rationales of the two studies, the investigator offered to provide every interested participant an analysis of his test scores during SMP I. More than 2,500 requests for such analyses were received, and all were honored. A sample IBM "print-out" for one student, together with the instructions for interpreting the test results, if found in Appendix A.

Following the explanation of the purposes of SMP II, each senior was asked to sign a Letter of Agreement, indicating his willingness to cooperate in providing data for SMP II. During these meetings, it was stressed that participation was completely voluntary and that all data would be kept confidential. They were also told that participants were identified only by code number and that even if they signed the Letter of Agreement, they were free to withdraw from the project at any time.

Those students who were willing to participate were asked to sign two copies of the Letter of Agreement, a copy of which is found in Appendix B. Both copies were signed in pencil, so they could be reproduced successfully with the copying machine available.

It should be noted that an unusually high percentage of all seniors thus contacted agreed to participate in the study. For example, out of more than 200 students in the senior class at Loy Norrix High School in Kalamazoo, Michigan, only three declined to sign the letter. The same response was received from the participants from the other schools. Also, if any seniors were absent on the days of the assembly program, school counselors were most cooperative in explaining the project to absentees and soliciting signatures. There was no evidence that any of the absentees refused to sign the Letter of Agreement.

After the assembly programs with the student participants, the parents were contacted by mail. The proposed project was described and a copy of a news release announcing the grant was enclosed. (See Appendix C) One copy of the Letter of Agreement was also enclosed, together with a return envelope. The parents were asked to sign the Letter of Agreement and return it in the envelope. If parents did not respond to the first letter, a follow-up letter was sent with the second copy of the Letter of Agreement. Together these efforts produced positive responses from slightly more than 98% of the participants in SMP I who professed that they intended to go to college.

During the summer of 1963, participants were contacted on several occasions to reconfirm their college plans and to keep the file of home addresses current. It should be noted that maintaining a complete up-to-date list of mailing addresses was one of the most difficult tasks in the study. Constant sources of difficulty involved (1) girls getting married, and thus changing their names and permanent addresses; (2) families moving; and (3) students transferring from one college to another. However, in spite of such problems, as a result of diligent efforts on the part of two excellent full-time secretaries, and several part-time student assistants the master file was kept up to date.

Another activity that was instrumental in "maximizing" the list of college-bound students was the rapport established during SMP I by at least three visits to each participating school each year, innumerable speeches at service organizations and PTA's about the Project, and accepting invitations to serve as Commencement Speaker. Visits were continued throughout SMP II during which information was obtained to maintain the mailing list. Various educational services were also provided the schools as a reciprocal gesture. Also, throughout the study numerous letters were sent to the participants. Some of these requested information about their activities, others offered to provide them with analyses of the data that were collected, and still others were in response to specific questions posed by the students. In the latter category more than 500 individual letters were sent each year. Copies of these various items of correspondence are found in Appendix D.

Together all these efforts enabled the principal investigator to maintain the participation throughout SMP II of more than 95% of the participants of SMP I who went to college.

Collecting the Data

The data for this study were obtained from three main sources, (1) questionnaires completed and returned by the participants; (2) the Kuder Preference Record, completed and returned by the participants; and (3) college transcripts.

During the academic years, 1963-64 and 1965-66, during which most of the participants were freshmen and juniors in college, each participant was sent a copy of the Kuder Preference Record which he was requested to complete and return. The Kuder Preference Record was selected because (1) it was administered to all participants of SMP I during their sophomore, junior and senior years, and hence, provided a basis for detecting possible changes in interest patterns among the participants; and (2) it can be self-administered and is easily scored.

During the academic years 1964-65 and 1966-67, during which most of the participants were sophomores and seniors in college, each participant was sent a questionnaire which sought information about the courses in which he was enrolled and any sources of financial aid, as well as about other issues. Copies of the letters and questionnaires are found in Appendix E.

Letters of explanation, as well as self-addressed, stamped, return envelopes, were included with all materials sent to the participants. Although some attrition was experienced due to changes of address, marriage, transfer to other colleges, and possibly neglect on the part of the participants, cooperation was generally excellent. Follow-up letters used to increase the returns on the various items appear in Appendix D.

The third source of data was the transcripts of the college work completed by each participant. After each academic year during which the study was undertaken, requests were made to all the colleges in which participants were believed to have been enrolled for transcripts of the participants attending their institution. The request was accompanied by a copy of the Letter of Agreement. A copy of the letter of request appears in Appendix F. No request was refused, although additional correspondence about the study was needed with some institutions.

In conclusion, one final point should be mentioned. During SMP I, the participants might be described as members of a "captive audience." The participants included all students who entered the seventh grade of the participating schools in the Fall 1957, and continued until they dropped out or graduated in June 1963. The tests were administered by school personnel and students were included "whether they liked it or not." However, with both SMP II, reported here, and SMP III, each participant could cooperate or not cooperate as he chose. Hence, the task of maintaining contact and rapport with the large number of individuals was enormous. As has been indicated earlier, frequent and varied contacts were made. In addition to the formal contacts, a number of informal ones were made in an effort to maintain good relationships, as well as up-to-date mailing lists. Two examples of such informal contacts were the Science Motivation Project Newsnotes and Christmas messages, copies of which appear in Appendix G. The investigator believes that such "extra" efforts assisted markedly in retaining a large group of participants.

CHAPTER III

BACKGROUNDS OF SMP II PARTICIPANTS AND COMPARISONS WITH THOSE OF PEERS IN SMP III

Purpose

The purpose of this chapter is to (1) describe the population of participants in Science Motivation Project II, and (2) compare these participants with their peers in Science Motivation Project III.

The Population

As stated earlier, the participants in this study participated originally in SMP I, which was designed to collect data about a large group of students during their junior- and senior-high school careers. As indicated on page 3 of Chapter I, twelve (12) communities and more than 6,000 participants were involved in SMP I. From among that population of participants, insofar as possible, those who went to college were studied as described earlier. Table 2 indicates the numbers of college-bound participants for whom usable data were collected.

Table 2

Community	Number of Participants
Angola, Indiana	40
Archbold, Ohio	27
Bryan, Ohio	51
Elkhart, Indiana	176
Kalamazoo, Michigan	254
Kankakee, Illinois	104
Kendallville, Indiana	35
Marshall, Michigan	63
Quincy, Michigan	22
Rockford, Illinois	324
University High School (Kalamazoo)	72
Wilmington, Illinois	23
Total	1,191

As one might assume, the majority of these students attended colleges and universities in their respective states. Some analyses related to the types of colleges and universities they attended appear later in the report. As one might further assume, not all of the students who entered college had graduated at the termination of the study. As of February 15, 1968, the available data indicated that 849 had completed at least the baccalaureate degree. A number of students have been or are in, military service and have not yet completed their baccalaureate degrees. Some female participants were married and have not continued college study, although correspondence indicates that they intend to.

A Comparison of SMP II and SMP III Participants

As indicated earlier, a concurrent study, now completed, was undertaken with the non-college bound peers of the college-bound participants in this study. Thus, a comparison of the two groups was possible. In comparing the two groups of participants, the total population of SMP III (non-college bound) participants was paired with the SMP II (college-bound) participants. The pairing was carried out by selecting twenty-two (22) items from the original SMP I data that reflected interest and/or achievement in various sciences, and intelligence. The scores on these items were then categorized into tenths of the total ranges of scores. The participants in SMP II and III were matched on the basis of the tenths into which their scores fell. Using the basis of tenths for associating each pair of potential mates with a pair of points in real Euclidean space of some dimension, varying with the individuals, it was possible to consider how far apart the pairs were using the sum of the absolute values of the difference of corresponding coordinates. The objective was to obtain as many pairs as possible without sacrificing likeness. Thus, it was deemed defensible to assume that each collection of pairs was alike if some pre-assigned small factor were identified whose distance did not exceed one or more than this factor times the dimension.

Using these criteria, nearly all SMP III participants found a mate when the factor was set to two. Thus, 120 SMP III participants were matched with 21 SMP II participants, the SMP II participants being paired with more than one SMP III participant.

Comparisons of Socio-Economic Levels

One measuring instrument used with the participants in the ninth grade was Your Educational Plans. According to the Counselor's Manual for the instrument,"Your Educational Plans provides a concise yet rich inventory of facts and attitudes as reported by a high school boy or girl." It is designed to elicit information that may assist in explaining gaps between a student's potential and performance and between his ability and aspiration.

The YEP deals with, among others, questions related to the student's father's occupational level; the educational level of the mother and father; the student's beliefs concerning his mother's and father's aspirations for his educational future; his perception of his academic and social standing among his peers; and his own occupational and educational aspirations and plans. It should be noted that response to all items on the YEP reflect only the student's beliefs about the factors mentioned. However, research evidence indicates that such responses are valid measures of these socio-economic factors.

With these considerations in mind, the YEP responses of the pairs of SMP II and SMP III participants were compared. In making the comparisons, frequency tables were prepared, arranged in fifths of the total range, for the YEP responses of the pairs. These tables provided the basis for the finds listed below:

1. There was a great difference between the mean occupational levels of the fathers of the two groups. The mean for the college-bound (SMP II) students fell in the "top professional" category consisting mainly of occupations that required extensive higher education. The mean for the non-college bound (SMP III) group fell in the "lower" occupational categories, namely, those not ordinarily requiring college-level training.

2. At the ninth-grade level, there was no discernible difference between the expressed occupational aspirations of the students in the college-bound (SMP II) and non-college-bound (SMP III) groups. Both groups, in general, aspired to enter occupations that required high levels of ability and education.

3. Although both groups of participants aspired at the ninth-grade level to high-level occupations (as indicated in 2 above), the two groups differed greatly in their plans for attending college. The mean for the SMP II participants fell in the category, "definitely to attend college." The mean for the SMP III participants fell in the category, "college questionable or unlikely." Thus, the students appeared to know at the ninth-grade level whether or not they would attend college.

4. As one might expect, the high school programs planned by the students orginarily followed the educational plans professed at the ninth-grade level. Nearly all of the college-bound (SMP II) students stated they were enrolled in a college-preparatory program in high school; whereas the majority of the non-college (SMP III) students were enrolled in a general or vocational program.

5. There was a great difference between the educational levels of the parents of the two groups. With both mothers and fathers of the SMP II students, the mean fell in the category, "have had some college training." In the case of the SMP III students, the means for both parents fell between the categories, "attended high school" and "graduated from high school."

6. The students' beliefs about their parents' aspirations for their future education were consistent with their professed educational plans. Among the college-bound SMP II group, with both the father and mother, the mean fell in the category, "thinks college is absolutely necessary for me." Among the non-college-bound SMP III students, the mean for both the father and mother fell in the category, "thinks college would be desirable, but not necessary."

7. The YEP also queries students about adults outside the immediate family whom they admire. In the case of the college-bound students, the "adult model" had in most cases attended college. Among the non-college-bound, in most cases the "adult model" had not attended college.

It is difficult to suggest that any of these findings are inconsistent with the findings of analogous research studies. They indicate the effect of the family's educational backgrounds and aspirations on those of the children. Where there is contact with college-trained adults, the children are more likely to aspire to, and prepare for, college.

Comparisons of Interest, Achievement and Intelligence

Comparisons were made between the participants in SMP II and SMP III using the scores obtained on the Kuder Preference Record; Parts I and II of the Science Achievement Test administered at the ninth-grade level; the Diagnostic Reading Test: Form A, administered in both the eighth and twelfth grades; and the SRA Tests of Educational Ability, Grades 9-12, administered in grade eleven. Among the more salient findings are these:

1. In comparing the scores from the Kuder Preference Record it was found that consequential differences existed between the two groups on the Scientific, Computational, and Clerical areas. The SMP II students expressed "about average interest" on the Scientific and Computational areas; whereas the SMP III students were "below average" on the Computational area and well below average on the Scientific area. However, with the Clerical area, the reverse was true. The SMP II students were "well below average" in interest in this area; whereas the SMP III students were slightly above average. There were no discernible consequential differences between the two groups on the other areas of the test.

2. The mean for the SMP II students on Part I of the science achievement test administered to all students in grade 9, fell in the fourth 1/5 of the total range, or above average. The mean for the non-college-bound SMP III group fell in the third 1/5, or about average. It should be noted that this is primarily a "factual recall" achievement test.

   On Part II of the science test, which is designed to be a critical thinking test, the mean for the SMP II group fell in the second 1/5; while that for the SMP III group was in the lowest 1/5. Here one may note that both groups were below average in thinking and reasoning skills, as measured by this test. However, the college-bound SMP II group achieved higher scores than did the non-college group.

3. The mean for the eighth-grade reading test for the SMP II students fell in the fourth 1/5 of the total range; that of the SMP III group fell in the third 1/5. In other words, at the eighth-grade level, while the majority of the non-college-bound students were "average" in reading ability as revealed by the test, the college-bound students were above average.

   By the senior year in high school, however, the mean for the college-bound SMP II students had shifted to the top 1/5 of the total range, whereas that for the SMP III students remained at the third 1/5, or about average.

4. On the intelligence test administered in grade 11, the mean for the SMP II students fell within the fourth 1/5 of the total range, or above average. The mean of the SMP III group fell in the second 1/5, or below average for the total group.

Summary

The purpose of this chapter was to describe the SMP II population and to reevaluate some of the data obtained during SMP I, while the participants in this study were in high school. The reevaluation enabled the researchers to compare the college-bound SMP II students with a matched group of non-college-bound SMP III students with respect to certain socio-economic and familial characteristics, as well as with patterns of interest, academic achievement and intelligence.

It was found that the matched sampling of college-bound SMP II students had higher-level socio-economic backgrounds than did the non-college-bound SMP III students. At the ninth-grade level, both groups of students seemed to have their future educational goals fairly well identified. The majority of the non-college-bound students did not, at that time, plan to attend college and were enrolled in general or vocationally-oriented high-school curricula. Conversely, the majority of the SMP II students who did go to college ultimately, stated when they were ninth graders that they would attend college and were enrolled in college-preparatory curricula.

Interestingly, however, at the ninth-grade level, both groups of students had extremely idealistic aspirations concerning their future occupations. The vast majority of both college-bound and non-college-bound populations aspired to occupations that required training beyond the high school.

The members of the college-bound group seemed to be influenced by a positive family interest in their future education; by family backgrounds that include broader educational experiences; and by family aspirations for their continued education. The non-college-bound group, seemingly with almost "equal intelligence," capabilities and interest, failed to have such motivation. The future path for higher education seems to be greatly influenced by family factors, at least for the subjects involved in these studies.

A comparison of the results on the Kuder Preference Record indicated that the college-bound students expressed about average interest in the Scientific and Computational areas, but low interest in the Clerical area. The reverse was true for the non-college-bound students; their interests were low in the Scientific and Computational areas, but above average in the Clerical area.

As a group, the college-bound students were above average in achievement level on a factual recall science test, whereas the non-college group was average. On the "critical thinking" section of the science tests, both groups were below average, although the college-bound students scored somewhat higher than did the non-college bound.

A comparison of scores obtained on reading tests at the eighth-grade level revealed that the college-bound were above average; whereas the non-college group was about average. However, the reading scores obtained on tests administered in the senior year indicated that the mean for the college-bound had shifted to the highest 1/5; whereas the mean for the non-college-bound remained "average."

A comparison of the intelligence scores of all SMP II students with those of SMP III indicates that the mean scores of the college-bound students were above average, whereas those of the non-college-bound SMP III students were below average.

The data reviewed here seem to confirm the generally-accepted beliefs that college-bound students come from higher socio-economic levels than non-college-bound; they achieve higher academically; they have higher I.Q.'s; and they receive stronger motivation for academic success from their families than do the non-college-bound students.

CHAPTER IV

FACTORS RELATED TO ACHIEVEMENT IN SCIENCE DURING THE FRESHMAN AND SOPHOMORE YEARS

Purpose

In this phase of the study, analyses were made of the science achievements of the SMP II participants following the freshman and sophomore years. It was thought desirable to make such analyses for the period when commitments to programs of study might not yet have been made, or were still subject to change.

As part of the total study, analyses were made of the relationships between the I.Q.'s of the participants and their grade-point averages in college science by computing product-moment coefficients of correlation. As might be expected, there was a modest degree of relationship, namely, a coefficient of correlation of .53 between achievement in the first two years of science and one of .61 between achievement in all the science courses elected for the four years of college. Obviously, the generally recognized variability among grading practices in colleges and universities made any conclusions somewhat suspect. However, it was thought that any conclusions might be more tenable if the analyses dealt with in this chapter were made holding I.Q. constant.

The analyses of concern here dealt with the relationships between the freshman, and two-year freshman and sophomore cumulative, grade-point averages in the sciences the SMP II participants elected in college, and factors measured during their participation in SMP I holding I.Q. constant. The I.Q.'s were measured during the junior year of high school with the SRA Tests of Educational Ability. The statistical device used in the analysis was analysis of covariance.

Findings

Table 3 that follows summarizes the analyses for determining the relationships described above. A discussion of the findings follows the table. Differences identified with the analyses of covariance beyond the 5% level were considered to be "not significant;" those between the 5% and 1% level, "significant;" and those below the 1% level, "very significant."

Table 3

Relationships Between Selected Factors Measured During SMP I and Science Achievement in College, Holding I.Q. Constant

Years of College Achievement	Factors Related to Achievement in College Science	"F" Value	Level of Significance
1a. Freshman year cumulative grade-point in science courses	Level of Science Interest as evidenced on Kuder Preference Record administered during the senior year of high school.	.3834	Not significant
1b. "	Numbers of "years" of high-school science elected (Note: the number of credits varied from 1 to 5. All participants elected at least one science course in high school. Some elected two in one year.)	3.8013	Very significant
1c. "	High-school size index (Note: the typical "athletic" classification of size of school was used, namely A, B, C and D schools, although in this study C and D schools were grouped together.)	.2466	Not significant
1d. "	Levels of occupational aspiration as evidenced on YEP administered in 9th grade. These include (1) positions requiring a college education; (2) "white-collar" occupations for which college is becoming increasingly required; (3) students planning to farm; (4) labor and service occupations for which college is not required; (5) those with no occupation in mind; and (6) girls not planning on an occupation for pay.	.9477	Not significant

Table 3 (continued)

Years of College Achievement	Factors Related to Achievement in College Science	"F" Value	Level of Significance
1e. Freshman year cumulative grade-point in science courses	Father's occupational level using 4 codes of YEP. These are (1) "top professional;" (2) "white-collar;" (3) farming; and (4) labor and service occupations	1.5683	Not significant
1f. "	College plans as evidenced on YEP, including (1) definitely will go; (2) almost sure to go; (3) very likely to go; (4) rather likely to go; (5) unlikely to go; and (6) definitely will not go.	.3252	Not significant
1g. "	Participants belief of his father's aspirations for his educational future.	1.1867	Not significant
1h. "	Participants belief of his mother's aspirations for his educational future.	1.3459	Not significant
1i. "	Father's educational level, i.e., (1) graduated from college; (2) some college, did not graduate; (3) vocational school after high school; (5) some high school, did not graduate; and (6) grade school only.	.5683	Not significant
1j. "	Mother's educational level (Note: same categories as father's above.)	.5650	Not significant
1k. "	High-school program, i.e., (1) college preparatory; (2) commercial; (3) general; (4) vocational; and (5) other.	1.0291	Not significant

Table 3 (continued)

Years of College Achievement	Factors Related to Achievement in College Science	"F" Value	Level of Significance
2a. Freshman and sophomore year cumulative grade-point average in science courses	Level of Science Interest as evidenced on Kuder Preference Record administered during the senior year of high school.	1.2745	Not significant
2b. "	Numbers of "years" of high-school science elected (Note: the number of credits varied from 1 to 5. All participants elected at least one science course in high school. Some elected two in one year.)	3.9014	**Very significant**
2c. "	High-school size index (Note: the typical "athletic" classification of size of school was used, namely A, B, C and D schools, although in this study C and D schools were grouped together.)	.4798	Not significant
2d. "	Levels of occupational aspiration as evidenced on YEP administered in 9th grade. These include (1) positions requiring a college education; (2) "white-collar" occupations for which college is becoming increasingly required; (3) students planning to farm; (4) labor and service occupations for which college is not required; (5) those with no occupation in mind; and (6) girls not planning on an occupation for pay.	1.5861	Not significant
2e. "	Father's occupational level using 4 codes of YEP. These are (1) "top professional;" (2) "white-collar;" (3) farming; and (4) labor and service occupations.	.8358	Not significant

Table 3 (continued)

Years of College Achievement	Factors Related to Achievement in College Science	"F" Value	Level of Significance
2f. Freshman and sophomore year cumulative grade-point average in science courses	College plans as evidenced on YEP, including (1) definitely will go; (2) almost sure to go; (3) very likely to go; (4) rather likely to go; (5) unlikely to go; and (6) definitely will not go.	.5254	Not significant
2g. "	Participants belief of his father's aspirations for his educational future.	2.0269	significant
2h. "	Participants belief of his mother's aspirations for his educational future.	2.1956	significant
2i. "	Father's educational level, i.e., (1) graduated from college; (2) some college, did not graduate; (3) vocational school after high school; (5) some high school, did not graduate; and (6) grade school only.	.5910	Not significant
2j. "	Mother's educational level (Note: same categories as father's above.)	.5650	Not significant
2k. "	High-school program, i.e., (1) college preparatory; (2) commercial; (3) general; (4) vocational; and (5) other.	.6028	Not significant

An analysis of the information in Table 3, which is restricted to data obtained during the freshman and sophomore years, indicates that these conclusions seem justified:

1. A high level of science interest as evidenced on the Kuder Preference Record administered during the senior year of high school does not have a significant relationship with the students' achievement in science

courses during the freshman year, or for both the freshman and sophomore years. One may postulate that the homogenization of underclassmen in large for teaching the introductory science courses may foster the homogenization of grades.

It is possible that the high level of science interest in high school which was accompanied by a high level of achievement in science in SMP I is a rather spurious relationship. Possibly high grades given in some high schools for less than high achievement may stimulate a high degree of science interest, yet not yield a background adequate for high science achievement in college.

2. It may be noted in 1b and 2b in Table 3 that for both the freshman and sophomore years, the number of years of high-school science a student completes has a "very significant relationship" with his achievement in college science. A number of published studies with respect to the values of high-school science have failed to suggest that it contributes greatly to success in college. However, these studies have ordinarily been undertaken with small groups of students. In this study the relationship is positive and high.

3. Consistent with the findings of SMP I for high school, the achievement of a student in science courses in college during the freshman and sophomore years is significantly related to his beliefs about his parents' aspirations for his educational future. This relationship seems to be independent of the educational levels of the parents. In brief, achievement in science courses in college does not seem to be a function of the extent of the parents' education, but rather of a student's belief about his parents' aspirations for him.

4. In some earlier studies, the size of the high school from which a student graduates has been indicated as a factor in achievement in science courses in college. This study, however, fails to suggest that the size of school is a significant factor. This finding is consistent with that of a major study undertaken by the principal investigator in the State of New York in the early 1950's with a large population of high-school students. In that study, it was indicated that achievement in high-school science bore little relationship to the size of the high school the student attended. This study was reported in The Journal of Experimental Education, XXIV (September 1955), 43-89.

Comparisons of Grade-Point Averages With Types of Colleges and Universities Attended

An effort was made to determine what relationships might exist for the freshman and sophomore years among students' I.Q., college grade-point averages and the types of colleges in which they were enrolled. In order to make this analysis, frequency tables were set up in which the I.Q.'s measured during the junior year of high school were tabulated against the students' grade-point averages for the first two years of college. The I.Q.'s were tabulated by tenths of the total range and the grade-point averages in eight categories, namely, 0-.5; .5-1; 1-1.5; 1.5-2; 2-2.5; 2.5-3; 3-3.5; and 3.5-4. Thus, the frequency tables prepared for the different categories of colleges each contained 80 cells.

The categories of colleges were modifications of the coding system for institutions of higher education formerly used by the Office of Education. The modified system was as follows:

Code 1 - The major state universities such as the University of Illinois and the University of Michigan.

Code 2 - Other state universities and land-grant universities that were autonomous from the major state university but which did not develop from teachers colleges or state colleges since World War II, for example, Purdue University and Iowa State University.

Code 3 - Institutions designated as state universities but which developed from teachers colleges since World War II. These included institutions like Bowling Green State University and Western Michigan University.

Code 4 - Institutions of higher education designated at the beginning of SMP I as teachers colleges.

Code 5 - Institutions of higher education not supported with public funds at the beginning of SMP II but which offered advanced degrees.

Code 6 - Four-year liberal arts colleges not offering advanced degrees, community colleges, and other colleges not fitting the above categories.

Obviously, some adjustments were necessary in classifying institutions of higher education under these Codes. For example, Northwestern University would ordinarily be classified in Code 5 but it more nearly resembles the universities in Code 2 and hence, it was so classified. In Ohio The Ohio State University, which is the land-grant university, was placed in Code 1, whereas Ohio University, the original state university in Ohio, was placed in Code 2. Other similar adjustments were made where "common sense" made them appropriate.

When the frequency tables were analyzed, it was obvious that it would be difficult to make many defensible generalizations. The difficulty arose from the recognized variability among universities in their grading policies and also because the numbers of cases in many of the 480 cells in the frequency tables were small. In some cells there were no cases. In addition, it was obvious that generalizations based on grouping data for all institutions would obscure certain specific characteristics and differences that might be significant. Hence, it was decided to present first certain defensible generalizations and then indicate more specifically some of the conclusions that were obscured by grouping the data.

Among the defensible generalizations are these:

1. In the largest institutions of higher education, namely those in Codes 1 and 2, the mean I.Q. of the enrollees fell in the sixth one-tenth of the total range of I.Q.'s of all participants in SMP II, or slightly above average. The mean overall grade-point average for these students for the first two years of college was about 2.5. It should be noted here that average I.Q. is based on the average for the students who attended college.

2. In those institutions in Code 3, the mean I.Q. of the enrollees, like that of the enrollees in the Codes 1 and 2 institutions, was in the sixth one-tenth of the total range of I.Q.'s, or slightly above average, and their mean grade-point average for the first two years of college was about 2.5.

3. In the Code 4 institutions of higher education or those designated as teachers colleges, the mean I.Q. of the students was in the fifth one-tenth of the total range, or slightly below average. However, their mean grade-point average was about 2.5.

4. In the Code 5 institutions, the mean I.Q. of the enrollees fell between the fifth and sixth one-tenth of the total range, and their grade-point average for the first two years of college was about 2.6.

   The mean I.Q. of the enrollees in the Code 6 institutions or the four-year liberal arts colleges fell between the fifth and sixth one-tenth of the range of I.Q.'s of all SMP II participants. The number of participants enrolling in Code 6 institutions was relatively small, but the mean grade-point average for the first two years of college was about 2.7, the highest for any of the category of institutions.

In analyzing in greater detail the data in the frequency tables as well as other data that were available, the following conclusions seem justified:

1. It was evident that students with the same intelligence test scores obtained substantially the same grades without regard for the type of institution in which they were enrolled. This generalization applies without regard for the area of study whether it be science, social science, or humanities. In other words, a student with an I.Q. of 115, insofar as the data collected here are valid, is as likely to get B grades in courses in a large state university as in an institution in any other category. The only exception to this statement is for students enrolled in the smaller four-year liberal arts colleges where the grades awarded appear to be somewhat higher.

2. Although it is evident in the generalizations listed above that the mean I.Q.'s of the enrollees in the various categories of institutions differ little, the mean I.Q.'s of students in specific institutions within categories vary greatly. For example, in some large state universities the mean I.Q. of those admitted as freshmen is about 15 points higher than the mean I.Q. of entering freshmen in other universities. However, by the end of the sophomore year the disparity becomes somewhat less. This is explained by the relatively great attrition among the lower-ability students in the former universities.

3. Although the cumulative grade-point average at the end of the sophomore year for students in all categories of institutions except Code 6 was about 2.5, the grade-point average for the first semester or term of the freshman year was typically 2.2 to 2.3. During the last term or semester of the freshman year, the grade-point average was about 2.4 to 2.5. In the sophomore year the overall grade-point average was about 2.6 to 2.7. The reasons for the increasing GPA is fairly evident, namely, attrition of the less able students.

4. At the end of the sophomore year, the attrition of students seems to have little relationship to the fields in which they apparently intend to major. It is, of course, difficult to classify students at the end of the sophomore year as being science majors or for that matter, majors in any other area because of the great mobility within institutions. However, there was no evidence that there was greater attrition among those who elected many semester hours of science courses than among those who elected fewer hours.

CHAPTER V

MOBILITY AND SCIENCE ACHIEVEMENT DURING FOUR-YEAR COLLEGE CAREERS OF SMP II PARTICIPANTS

Purpose

In this chapter, the findings and conclusions of a number of analyses of factors related to the four-year college careers are found. They appear under descriptive subheadings.

Mobility of Students

Table 4 that follows indicates the numbers of different institutions of higher education in which the participants in SMP II were enrolled. The data include all 1,191 participants without regard for their receiving the baccalaureate degree by February 15, 1968.

Table 4

Numbers of Different Institutions in Which Participants Were Enrolled

Numbers of Institutions of Higher Education	Numbers of Students (N = 1,191)
1	894
2	267
3	28
4	2

The distribution in Table 4 indicates that about 75% of the 1,191 participants attended only one college. It should be noted that of the 267 participants who attended two or more colleges, 135 enrolled initially in institutions that did not offer a baccalaureate degree. These were mainly public and private community and junior colleges, with a few "collegiate centers" and technical institutes represented. Obviously, if these participants were to complete the baccalaureate degree, it would have been necessary for them to have enrolled in at least one other institution of higher education. One may conclude that the college enrollees in this study represented a stable college population.

In Table 5 that follows there appears an analysis of the different categories of institutions of higher education in which the participants enrolled initially and from which they ultimately received the bachelor's degree. The system for coding categories of institutions appears on page 27, Chapter IV.

Table 5

Categories of Institutions of Initial Enrollment and From Which Baccalaureate Degree was Received

Institution Code	Number of Initial Enrollments (N = 1,191)	Number of Graduates (N = 849)
1	203	128
2	147	121
3	314	275
4	88	73
5	108	99
6	331	153

The data in Table 5 indicate that the vast proportion of participants in SMP II enrolled initially in publicly-supported institutions of higher education. These include the initial enrollments for institutions under Codes 1-4, as well as a substantial proportion of the 135 under Code 6 who went mainly to community and junior colleges. Of the 849 participants who received the baccalaureate degree by February 15, 1968, 71% graduated from publicly-supported institutions, whereas only 29% graduated from the private institutions in Codes 5 and 6. This number is increased slightly by the few who graduated from major private universities placed in Code 2.

An analysis of data for individual participants indicates that the greatest mobility over the time span from initial enrollment to graduation other than with students in community and junior colleges is from the "developing universities" in Code 3 to the major state universities in Code 1 and vice versa. The explanation is not revealed by the data but one may suggest that many students for one reason or another fail to adjust to the major university and find the smaller institution "more comfortable." This point is supported by the large number of transfers from the major university by the end of the freshman year. One may suggest also that many students enter smaller universities to enroll for the "basic courses" and then enroll in the major university for the opportunities for more specialized study. This viewpoint is supported by the great number of transfers from the smaller universities to the major university between the sophomore and junior years.

The analysis for the freshman and sophomore years which appears in Table 3 was replicated for the full four years of the participants in SMP II who graduated by February 15, 1968. However, data were included only for those students who elected science courses during the junior or senior years, or 304 of the graduates. The results of the four-year analysis appear in Table 6.

Table 6

Relationships Between Selected Factors Measured in SMP I and Science Achievement During Four Years of College Holding I.Q. Constant

Years of College Achievement	Factors Related to Achievement in College Science	"F" Value	Level of Significance
1a. Four-year cumulative grade-point average in science courses	Level of Science Interest as evidenced on Kuder Preference Record administered during the senior year of high school.	.3772	Not significant
1b. "	Numbers of "years" of high-school science elected. (Note: the number of credits varied from 1 to 5. All participants had elected at least one science course in high school. Some elected two in one year.)	4.2733	Very significant
1c. "	High-school size index (Note: the typical "athletic" classification of size of school was used, namely A, B, C and D schools, although in this study C and D schools were grouped together.	.3935	Not significant

Table 6 (continued)

Years of College Achievement	Factors Related to Achievement in College Science	"F" Value	Level of Significance
1d. Four-year cumulative grade-point average in science courses	Levels of occupational aspiration as evidenced on YEP administered in 9th grade. These include (1) positions requiring a college education; (2) "white-collar" occupations for which college is becoming increasingly required; (3) students planning to farm; (4) labor and service occupations for which college is not required; (5) those with no occupation in mind; and (6) girls not planning on an occupation for pay.	.6706	Not significant
1e. "	Father's occupational level using 4 codes of YEP. These are (1) "top professional;" (2) "white-collar;" (3) farming; and (4) labor and service occupations.	2.2555	Significant
1f. "	College plans as evidenced on YEP including (1) definitely will go; (2) almost sure to go; (3) very likely to go; (4) rather likely to go; (5) unlikely to go; and (6) definitely will not go.	.3622	Not significant
1g. "	Participant's belief of his father's aspirations for his educational future.	2.1470	Significant
1h. "	Participant's belief of his mother's aspirations for his educational future.	2.7378	Significant
1i. "	Father's educational level, i.e., (1) graduated from college; (2) some college, did not graduate; (3) vocational school after high school; (4) graduated from high school; (5) some high school, did not graduate; and (6) grade school only.	.0008	Not significant

Table 6 (continued)

Years of College Achievement	Factors Related to Achievement in College Science	"F" Value	Level of Significance
1j. Four-year cumulative grade-point average in science courses	Mother's educational level (Note: same categories as father's on preceding page.)	.8790	Not significant
1k. "	High-school program, i.e., (1) college preparation; (2) commercial; (3) general; (4) vocational; and (5) other.	1.0456	Not significant

An examination of the data in Table 6 indicates little more than an extension of the findings of Table 3. Again, the numbers of "years" of science the student elects in high school bears a very significant relationship to his four-year cumulative grade-point average in science courses. Also, as with the analyses for the freshman and sophomore years, the belief the student expressed on the 9th grade YEP about his father's and mother's aspiration for his future educational plans still bears a significant relationship to achievement in science courses at the college level. However, another factor proved to be significant, namely, the father's occupational level at the time the student was in the 9th grade. In other words, students whose fathers were in the top professional group when the student was in the 9th grade achieved significantly better in college science courses than students whose fathers were in other occupational areas.

The findings of these studies indicate the importance of the student's early beliefs about his parents' aspirations for his future educational plans.

CHAPTER VI

MISCELLANEOUS FACTORS RELATED TO COLLEGE ACHIEVEMENT

Purpose

In Chapters 3, 4, and 5, analyses were made to elicit information for answering the questions posed in "The Problem" on page 9. However, during the course of the study, a number of another analyses were made to complement those just mentioned. The findings of some of these relevant analyses appear in this Chapter.

Effect of the High-School Teacher

1. In Science Motivation Project I analyses were made to determine the relationship between achievement in high-school science and the amount of graduate work in science elected by the high-school science teachers. It was found that the greater the amount of graduate work in science taken by the teacher, the greater was the achievement of the student in high-school science. In other words, the grade-point averages in science were greatest for those students who had teachers who had elected much graduate work in science.

   In this study, an effort was made to determine what relationships might exist between achievement in courses in college science and the graduate work elected by the high-school science teacher. The analyses failed to elicit any significant or consequential relationships.

2. A reanalyses of data from SMP I revealed that students who had contact with teachers with extensive and recent graduate work in science tended to elect more science courses in high school. Further, it was discovered in SMP II that the greater the number of science courses a student elected in high school, the better grades he received in science courses in college. This was also true for the overall grade-point averages as well as for the grade-point average in science courses. Thus, the influence of the science teacher, at least insofar as achievement in college is concerned, is indirect, namely, in motivating the student to elect more courses in science, which in turn does bear a relationship to the students grade-point averages in science courses in college.

Interest In and Elections Of Science Programs in College

In the previous chapters, analyses were made concerning the relationship between science interest as measured by the Kuder Preference Record and achievement in science courses. However, some other analyses that were made concerning interest are cited below:

1. An analysis was made of the numbers of persons whose Science interest remained in the upper quarter of the range of Science interest scores from high school through college; in the lower quarter; and in the middle half. It was discovered that the scores of 87 participants in SMP II remained in the upper quarter of the range throughout high school and college. The scores of 200 remained in the middle half of the range, and those of 79 in the lower quarter. It should be mentioned, however, that the scores varied greatly, although they remained within the ranges indicated.

2. An examination of the transcripts of the 849 graduates as of February 16, 1968, indicated that 317 had "declared" science majors. Among the 79 in the lower quarter of Science interest, only 15 completed a science major. Of the remaining 302 students there was no evidence of any concentration within the range from the lower quarter through the upper limit. The Science interest scores of the science majors were almost randomized throughout the upper three-quarters of the range. As indicated earlier, there was no evidence of any significant relationship between science interest and achievement in science courses in college. In addition here, no evidence is found that interest bears any significant relationship to the election of science courses in terms of completing a science major. Those students with a declared science major had grade-point averages in science courses that ranged from just above 2.0 to 4.0, but among these, Science interest scores were almost randomized.

Factors Related to College Entry and Continuous Enrollment

1. About 85% of the students who participated in SMP II enrolled in college immediately after graduation from high school. The vast majority of these came from homes in which the parents income fell in the top 1/5 of the range of income level coded in the YEP. However, the majority of the 15% of the students who did not enter college in the fall 1963, entered one year later. Most of these late enrollees were admitted to the major state

universities classified under Code I. The mean income level of the families of these students, however, was in the fourth one-fifth of the total range of incomes. One may assume, therefore, that these students found it necessary to work in order to raise money for the first year of college. The I.Q. scores of these students did not differ significantly from those of students who entered college immediately after graduation.

2. Of those students who dropped out of college for a year or more after being enrolled, but who did not enter military services, the largest number left Code III schools. This is not surprising since this group of schools had the greatest number of SMP II enrollees. However, the number of students who dropped out for a year or more, other than for military service, was not sufficiently large to warrant conclusions of great validity.

3. The majority of our students in 2 above who interrupted their college careers voluntarily, came from homes in the top income group. Hence, it appears that the reasons for interruption were other than financial.

Part-Time Work and Scholarships

During the course of study, questionnaires were sent to the students during their sophomore and senior years to ascertain whether or not they had worked either part-time or full-time while going to college, and whether or not they had received financial aid in the form of scholarships. The following findings emerged:

1. The students who worked during their college careers exhibited these characteristics:

    a. The fathers were in the highest occupational group.

    b. The fathers had enrolled in college, and about half completed the baccalaureate degree.

    c. The mothers had graduated from high school and more than half had some college experience.

    d. The student indicated that both the father and the mother thought that college was an essential experience for him.

2. The salient characteristics that typified students who received scholarship aid were these:

    a. The fathers were in the highest occupational group.

    b. The parents had slightly less formal education than the parents of the students who worked.

    c. The student indicated that both parents believed that college was essential for him.

3. Of those students who attended college and received scholarship aid the overall grade-point average of about 85% ranged between 2.5 and 3.0. Of this group, however, the mean I.Q. fell only in the 6th tenth of the total range of I.Q. scores of all the SMP II participants. Hence, those entering with scholarship aid ordinarily were the students with about average ability.

4. Of those who entered college as freshman without scholarship aid, 90% had grade-point averages ranging between 2.0 and 2.8. The mean I.Q. of this group fell in the 5th tenth of the total range of I.Q. scores or slightly above that of those who received scholarship aid.

5. Among the upperclassmen, the majority of the students who worked but did not receive scholarship aid had I.Q.'s that fell in the 5th tenth of the total I.Q. range. However, among the upperclassmen who held scholarships but did not work, the mean I.Q. fell in the 7th or 8th tenth of the total range or well above average.

Two general conclusions did emerge from the analyses, namely, these:

1. Student achievement in science or in all courses does not seem to be a function of scholarship aid.

2. If a student has a high level of aspiration as measured by the YEP, he works in college or manages to get scholarship aid.

CHAPTER VII

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to determine to what extent factors such as reading ability, intelligence, interest, high-school science achievement, high-school teacher background, and family background might be related to the election of, and success in, science courses in college. The population for the study emerged from a previous longitudinal study of motivational factors related to election of, and achievement in, secondary-school science courses. The initial study was conducted during 1957 through 1963 and involved more than 6,000 students enrolled in twelve (12) school systems in the Midwest. This earlier investigation, known as Science Motivation Project I, provided much data about the students' backgrounds while the students were in grades 7-12. These data were available for the study reported herein.

At the termination of SMP I, all seniors in the participating schools were contacted in an effort to identify those who intended to enter college and elicit their cooperation in continuing to provide information during their college careers. From the original SMP I group of more than 6,000, 1,191 college-bound students were identified. Of these, 849 had received a bachelor's degree as of February 15, 1968.

In order to determine possible factors affecting their achievement in college science, three main sources of information were used:

1. Kuder Preference Records, which revealed interest patterns, were administered during the participants' freshman and junior years in college.

2. Questionnaires, seeking information concerning course elections, sources of financial aid, and other factors, were disseminated during the participants' sophomore and junior years.

3. College transcripts were obtained for each year a participant attended college.

In addition, a reanalysis of data collected while the students were in secondary school made it possible to determine to what extent, if any, secondary-school experiences were related to college achievement in the sciences and in all courses. It also made it possible to compare the college students who were participants in this study with a matched group of non-college-bound students.

Since each chapter of this report contains a summary, a detailed summary here would be redundant. However, some of the more cogent findings include the following:

1. The college-bound students differed markedly from their non-college-bound peers in intelligence, interest patterns, academic achievement, and family backgrounds. The data confirm the generally-accepted belief that college-bound students come from high socio-economic homes and have parents with high aspirations for the future education of the children. Further, the college-bound group had higher I.Q. levels; higher reading ability; and higher academic achievement in high school than the non-college-bound group.

2. Of the total college-bound group, about 85% entered college directly after high-school graduation. The majority of the remaining 15% entered a year later. The latter group came from homes of slightly lower economic backgrounds, indicating the probable necessity to work a year to save money for college.

3. The vast majority of the students attended publicly-supported institutions of higher education. Of the college graduates, about 71% obtained degrees from such institutions. The greatest number of participants enrolled in the smaller "developing" state colleges and universities.

4. The two most significant factors affecting success in college were I.Q. and the student's belief that his parents had concerns about his educational future. These findings apply to the secondary-school and college careers of participants.

5. Students' patterns of interest were related to science achievement in secondary school, but not in college. However, if a student had a high interest in science in high school, he elected more science courses than students with a low science interest. If he elected a large number of science courses in high school, his achievement in college science was higher than for students who did not.

6. The size of the high school from which a student graduated bore no relationship to the size of college in which he enrolled. Neither was the

size of college significant with respect to his overall grade-point average or his science grade-point average. The one exception was the slightly higher GPA's earned by students enrolled in small liberal arts colleges.

7. At the high-school level, students' science elections and achievement were related to the amount and recency of graduate work taken by their teachers. But at the college level, the amount of graduate work in the high-school teacher's background did not appear to be a factor. However, indirectly, there was a relationship, since at the secondary level, students who studied with teachers with much graduate work in science elected more courses in science; and the more courses elected in high school, the greater was the college science achievement.

8. Surprisingly, students who worked part-time or full-time in college came from families with more formal education than those who received scholarship aid. Also, those who received scholarship aid had slightly lower I.Q. scores than those who did not. However, achievement in college was not a function of scholarship aid.

Conclusions and Recommendations

Consumers of this report must, of course, draw their own conclusions after perusing the findings. However, the principal investigator would like to make the following personal conclusions and recommendations:

1. The two most influential factors affecting a student's achievement in both high school and college appear to be his native intelligence and the support of a family that believes in the importance of education. Good, bad or indifferent, these factors are predetermined and can be altered little, if any, by high-school and college curricula, teachers, or methods of teaching. In other words, the "die seems to be cast" before students enter school.

2. The influence of the family is evident in a survey of sources of financial support. Apparently most of the scholarship aid goes to students of about average I.Q. in the range of scores for college and of high socio-economic background. The parents have above

average aspiration for their children. It would appear that methods of awarding scholarship aid might well be reviewed.

3. Students who work while in college have slightly higher I.Q.'s than those who receive scholarship aid and also come from families of the higher socioeconomic levels. Here, however, parents have slightly higher formal educational backgrounds and even higher levels of aspiration for the children than "scholarship parents." Thus, they apparently engender the attitude, "College is well worth working for."

4. Finally, high-school guidance counselors apparently might well purge their files of interest inventories. They appear to be of little use as an indication of the future occupational choices of college-bound students. While interest is a factor in high-school success, it appears to bear little or no relationship to the election of, and success in, college courses. One possible answer to motivating students to achieve particularly in science is to urge high-school teachers to continue to take up-to-date graduate work in science. This in turn seems to stimulate secondary-school students to elect many science courses in high school which in turn is related positively to success in science courses in college.

APPENDIX A

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECT II

KALAMAZOO, MICHIGAN
49001

February 15, 1965

To: All Participants in Science
Motivation Project I, 1957-63

Re: Interpretation of Test Scores

From: George G. Mallinson, Project Director

Dear Participant:

As you are well aware, all of you receiving this letter were participants in a long-term research project, supported by the Federal Government, known as "Science Motivation Project I." Some of you participated for all six years, while others contributed to the study for only a year or two. However, without regard for how long you participated, we promised to send you, when the study was completed, an analysis of the scores of all the tests you took.

I regret sincerely that a year has elapsed before it was possible to send you the information. We did underestimate the staggering task involved in making complete analyses for nearly 4,000 students. However, at this time I am sending your individual analysis. The IBM "print-out" that is enclosed lists all the tests you took during the course of the study. Enclosed also you will find a brochure of information to assist you in interpreting your scores.

In addition to the test scores and interpretation you will find a self-addressed postcard. We would very much appreciate your completing the postcard and mailing it at your earliest convenience. As you are aware, we are now engaged in a follow-up study of the students who participated in SMP I. The new project is supported by the Federal Government and is called Science Motivation Project II. As you can well imagine, it is difficult to keep our files current, now that you are all out of high school. Your continued assistance in supplying us with information is greatly appreciated.

If you have any questions about the analyses write me directly and I'll respond individually to any letter.

Best wishes to all of you for continued success.

Sincerely,

George G. Mallinson, Dean and
Director, Science Motivation
Projects I and II

GGM:LF
Enclosures
  IBM Sheets
  Instructions for Interpretation
  Return postcard

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECT II

KALAMAZOO, MICHIGAN
49001

October 30, 1965

Dear Student:

Science Motivation Project II is now beginning its third year, and the data accumulated are being added to those collected on the participants when they were part of Science Motivation Project I from 1957-63. We have kept records, as accurately as possible, on all participants who have attended institutions of higher education of one variety or another, provided they chose to have us do so. Although we have been able so far to have personal contact with only a few participants, we have been extremely gratified with the willingness of these persons to cooperate.

A short time ago we sent you a questionnaire concerning your activities in higher education after you completed high school. It may be that we have misplaced some correspondence or that the item was lost in the mail. However, we do not have a completed questionnaire from you in our files. We are therefore enclosing another copy with the sincere hope that you will be willing to fill it out appropriately and return it to us in the enclosed self-addressed envelope.

A number of requests were received during the summer from your colleagues and perhaps from you about the aims and results of the Project. We are now processing the appropriate data for individual replies. All of you will be hearing soon about Science Motivation Project III which just received Federal support.

Again, I want to express my sincere appreciation to you for Western Michigan University and for the Cooperative Research Program of the U. S. Office of Education for your valuable assistance. May I say that your cooperation is greatly needed and sincerely appreciated.

Sincerely,

George G Mallinson

George G. Mallinson
Dean and Director
Science Motivation Projects I and II

GGM:pfm
Enclosures

INSTRUCTIONS FOR
THE INTERPRETATION OF SCORES ON TESTS
ADMINISTERED DURING SMP I

I. How to Locate Your Test Scores on the IBM Print-Out Sheet:

You will find attached a small slip of IBM print-out paper with your name at the top. In a vertical row at the left, you will note numbers 2-9; these indicate the rows of scores from left to right. Along the bottom, you will note numbers 1-17; these indicate the vertical columns of scores. The scores of all tests that you took during the Science Motivation Project I are printed on the sheet where a row and a column come together. For example, if you took the Dunning Physics Test in 1962, the score you obtained on the test appears on the sheet where row 8 and column 10 cross.

The information in section II below lists all the tests that were administered during SMP I. In every case, the first number of the pair of numbers tells the row and the second tells the column in which the score appears. Thus, you can find your score, if you took the test, by looking up the row and column position, and locating it on the IBM print-out sheet. It should be remembered that no student took all the tests. Only the scores on the tests you took are listed on your sheet.

II. Positions of Test Scores on IBM Sheet:

A. Tests Administered in 1957-58:

1. SRA Primary Mental Abilities:

(A general intelligence test, made up of sub-parts listed below:)

a.	Verbal ability	row 2, column 1
b.	Spatial ability	" 2, " 2
c.	Reasoning ability	" 2, " 3
d.	Number ability	" 2, " 4
e.	Word fluency	" 2, " 5
f.	Total score on sections a-e	" 2, " 6
g.	Intelligence Quotient (I.Q.)	" 2, " 7

2. SRA Junior Inventory:

(An inventory of "needs and problems" of students)

a.	Problems related to health	row 2, column 8
b.	Problems related to other people	" 2, " 9
c.	Problems related to school	" 2, " 10
d.	Problems related to yourself	" 2, " 11
e.	Problems related to home	" 2, " 12

3. SRA Achievement Series: Science:

a.	Part I (factual information)	row 2, column 13
b.	Part II (reasoning ability)	" 2, " 14

4. SRA Achievement Series: Arithmetic:

(Note: this was not given in all schools)

a.	Part I (reasoning)	row 2, column 15
b.	Part II (concepts of math)	" 2, " 16
c.	Part III (computation ability)	" 2, " 17

B. Tests Administered in 1958-59:

1. Diagnostic Reading Test:

(A measure of reading ability; composed of following sub-parts)

a.	Rate of reading	row 3, column 2
b.	Story comprehension	" 3, " 3
c.	Vocabulary	" 3, " 4
d.	Total comprehension	" 3, " 5

2. SRA Junior Inventory:
(Repeat of same test given in 1957-58)

a.	Problems related to health	row 3, column 7
b.	Problems related to other people	" 3, " 8
c.	Problems related to school	" 3, " 9
d.	Problems related to yourself	" 3, " 10
e.	Problems related to home	" 3, " 11

3. SRA Achievement Series: Science:
(Repeat of same test given in 1957-58. Parts a and c are the same as the test given in 1957-58; part b had a few extra questions)

a.	Part I (factual information)	row 3, column 12
b.	Part II (reasoning - long form)	" 3, " 13
c.	Part II (reasoning - short form)	" 3, " 14

4. SRA Achievement Series: Arithmetic:
(Repeat of same test given in 1957-58)

a.	Part I (reasoning)	row 3, column 15
b.	Part II (concepts)	" 3, " 16
c.	Part III (computation)	" 3, " 17

C. Tests Administered in 1959-60:

1. SRA Primary Mental Abilities:
(Same test given in 1957-58)

a.	Verbal ability	row 4, column 1
b.	Spatial ability	" 4, " 2
c.	Reasoning ability	" 4, " 3
d.	Number ability	" 4, " 4
e.	Word fluency	" 4, " 5
f.	I.Q.	" 4, " 6

2. Nelson Biology Test
(A test of knowledge of biology) row 4, column 7

3. Your Educational Plans

This is a questionnaire-type of inventory that obtains information about a student's future educational and occupational plans. The analysis of this test is extremely detailed. Since a detailed analysis of each student was sent to the school shortly after the test was given, no analysis is given here. Participants who are interested might obtain an analysis by contacting the school they attended during the ninth grade. Scores on this test are given in row 4, column 8 through row 4, column 17; in row 5, column 1 through row 5, column 17; and in row 6, column 1 through row 6, column 4.

4. SRA Achievement Series: Science:
   (Same test given in 1957-58 and 1958-59)

a. Part I (factual information)	row 6, column 5
b. Part II (reasoning)	" 6, " 6

5. SRA Achievement Series: Arithmetic:
   (Same test given in 1957-58 and 1958-59)

a. Part I (reasoning)	row 6, column 7
b. Part II (concepts)	" 6, " 8
c. Part III (computation)	" 6, " 9

D. Tests Administered in 1960-61:

1. Kuder Preference Record:
   (A measure of interest in various areas of work)

a. Interest in outdoor areas	row 6, column 10
b. Interest in mechanical areas	" 6, " 11
c. Interest in computational areas	" 6, " 12
d. Interest in scientific areas	" 6, " 13
e. Interest in persuasive areas	" 6, " 14
f. Interest in artistic areas	" 6, " 15
g. Interest in literary areas	" 6, " 16
h. Interest in musical areas	" 6, " 17
i. Interest in social service areas	" 7, " 1
j. Interest in clerical areas	" 7, " 2

2. ACS-NSTA Chemistry Test:
   (A test of achievement in chemistry)

a. Part I (factual Knowledge)	row 7, column 3
b. Part II (reasoning and computation)	" 7, " 4
c. Total	" 7, " 5

3. Nelson Biology Test: row 7, column 6
   (Achievement in biology)

4. Tests for General Physical Science: row 7, column 7
   (Achievement in physical science)

5. Earth Science - Biology Test row 7, column 8
   (Achievement in combined course)

E. Tests Administered in 1961-62:

1. Kuder Preference Record:
   (Same test given in 1960-61)

a.	Outdoor area	row 7, column 9
b.	Mechanical area	" 7, " 10
c.	Computational area	" 7, " 11
d.	Scientific area	" 7, " 12
e.	Persuasive area	" 7, " 13
f.	Artistic area	" 7, " 14
g.	Literary area	" 7, " 15
h.	Musical area	" 7, " 16
i.	Social service area	" 7, " 17
j.	Clerical area	" 8, " 1

2. SRA Tests of Educational Ability:
   (A test designed to measure a student's potential for success in high-school work; composed of three sub-parts)

a.	Language ability	row 8, column 2
b.	Reasoning ability	" 8, " 3
c.	Quantitative ability	" 8, " 4
d.	Total	" 8, " 5

3. Advanced Biology Test: row 8, column 6
   (Achievement in a second year course)

4. ACS-NSTA Chemistry Test:
   (Same test given in 1960-61)

a.	Part I (factual knowledge)	row 8, column 7
b.	Part II (reasoning and computation)	" 8, " 8
c.	Total	" 8, " 9

5. Dunning Physics Test: row 8, column 10
   (Achievement in Physics)

6. Nelson Biology Test row 8, column 11

7. Tests for General Physical Science: row 8, column 12

8. Earth Science Test: row 8, column 13

F. Tests Administered in 1962-63:

1. Kuder Preference Record:
(Same test given in previous years)

a. Outdoor area	row 8, column 14
b. Mechanical area	" 8, " 15
c. Computational area	" 8, " 16
d. Scientific area	" 8, " 17
e. Persuasive area	" 9, " 1
f. Artistic area	" 9, " 2
g. Literary area	" 9, " 3
h. Musical area	" 9, " 4
i. Social service area	" 9, " 5
j. Clerical area	" 9, " 6

2. Diagnostic Reading Test:

a. Words per minute	row 9, column 7
b. Vocabulary	" 9, " 8
c. Comprehension	" 9, " 9
d. Total	" 9, " 10

3. Advanced Biology Test: row 9, column 11

(Achievement in second year biology - no percentile ranks are available for this test; upon request participants may obtain additional information about their general rank on this test.)

4. ACS-NSTA Chemistry Test:

a. Part I (factual knowledge)	row 9, column 12
b. Part II (reasoning and computation)	" 9, " 13
c. Total	" 9, " 14

5. Dunning Physics Test row 9, column 15

6. Nelson Biology Test row 9, column 16

7. Tests for General Physical Science row 9, column 17

III. Interpretation of Test Scores:

The tables that follow give the score that is at the 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, 90th, and 99th percentile for each test. A **percentile** indicates the approximate position of a score within the total range of scores that were obtained on a test. For example, if a score is at the 20th percentile, it indicates that about 20% of the people who took the test received lower scores. If a score is at the 50th percentile, it means that about half the people received lower scores. Obviously, scores at the 50th percentile are right "in the middle" of the total range. Scores lower than the 20th percentile are generally considered to be below average; those above about the 75th percentile are considered to be well above average.

Many of your scores will fall between percentiles. But if you examine the lowest scores at the percentiles above and below, you can estimate the percentile at which a score will fall.

You should remember in interpreting scores that no test is a perfect measure of ability, achievement or interest. They are merely approximate indications. A test score interpretation such as this will only give you a general approximation of your overall matrix of interest and ability.

PERCENTILE RANKS

1. SRA Primary Mental Abilities - 1957-58 Administration

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Verbal Ability	6	9	12	14	15	17	19	22	25	38
Spatial Ability	-	4	9	13	16	19	22	25	30	53
Reasoning	4	6	8	9	10	12	14	16	18	32
Number Ability	5	7	9	11	13	14	17	19	22	46
Word Fluency	14	18	20	22	24	26	29	32	37	55
Total	77	85	92	98	102	106	112	117	124	140

2. SRA Primary Mental Abilities - 1959-60 Administration

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Verbal Ability	8	13	17	19	22	24	26	29	33	49
Spatial Ability	0	10	16	19	23	26	29	33	39	54
Reasoning	4	8	11	13	15	17	18	20	22	30
Number Ability	4	9	11	14	16	18	20	22	26	56
Word Fluency	17	22	26	29	32	35	38	42	47	73
Total	75	87	94	99	103	108	113	121	128	140

3. Kuder Preference Record: Males (Same percentiles for each year)

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Outdoor Area	26	34	40	44	48	52	56	61	67	80
Mechanical Area	28	34	40	42	46	48	52	56	59	68
Computational Area	15	18	21	22	24	26	28	31	35	52
Scientific Area	26	31	35	38	42	44	48	52	58	70
Persuasive Area	27	31	35	37	40	42	45	49	56	80
Artistic Area	15	18	22	23	26	28	30	34	40	52
Literary Area	9	12	14	15	17	19	21	24	29	42
Musical Area	5	8	10	11	13	15	18	21	25	30
Social Science Area	23	29	33	35	37	40	43	47	52	68
Clerical Area	31	37	40	42	45	48	52	56	62	84

Please note that the table above is for males only. The table of percentiles for females appears on the next page.

4. **Kuder Preference Record: Females:** (Same percentiles for each year)

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Outdoor Area	17	21	25	28	31	34	38	42	50	76
Mechanical Area	13	16	18	20	22	24	27	30	34	58
Computational Area	12	15	18	20	22	23	25	28	32	47
Scientific Area	16	19	23	26	28	32	34	40	48	66
Persuasive Area	27	31	35	37	40	42	44	48	53	69
Artistic Area	16	20	24	26	28	31	34	37	43	52
Literary Area	10	14	16	18	19	22	24	26	31	42
Musical Area	19	13	15	17	19	21	23	25	27	30
Social Science Area	34	39	43	45	48	52	56	60	66	79
Clerical Area	36	46	52	55	58	64	68	72	80	96

5. **Diagnostic Reading Test** - 1958-59 Administration

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Rate	147	175	192	208	225	238	262	287	335	495
Vocabulary	14	18	21	23	26	28	31	34	40	52
Comprehension	10	14	17	19	21	23	25	27	30	36
Total	27	33	38	43	47	51	56	62	69	83

6. **Diagnostic Reading Test** - 1962-63 Administration

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Rate	195	219	231	244	257	274	291	313	350	455
Vocabulary	26	31	34	37	41	44	47	50	54	58
Comprehension	19	22	24	26	28	30	31	33	34	38
Total	47	55	60	65	69	73	77	82	87	94

7. SRA Junior Inventory: Males (Same percentiles for each year)

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Health	--	--	1	2	3	4	5	6	7	13
People	--	--	--	1	2	3	4	5	7	13
School	--	1	2	3	4	5	7	9	12	19
Myself	--	1	2	3	4	5	6	8	10	15
Home	--	--	--	1	2	3	4	5	6	12

8. SRA Junior Inventory: Females (Same percentile for each year)

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Health	--	--	1	2	3	4	5	6	7	14
People	--	--	--	1	2	3	4	5	7	14
School	--	1	2	3	4	5	6	7	9	14
Myself	1	2	3	4	5	6	7	8	11	20
Home	--	--	--	1	2	3	4	5	7	15

9. SRA Tests of Educational Ability:

Lowest Score at Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Language	16	20	23	25	26	30	30	33	38	50
Reasoning	11	14	15	18	18	19	20	21	25	30
Quantitative	10	13	15	16	17	18	19	20	24	30
Total	39	48	54	58	60	65	67	72	83	110

10. Dunning Physics Test: (Same percentiles each year)

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Total	20	24	27	31	34	38	42	46	52	69

11. Nelson Biology Test (Same percentiles each year)

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Total	20	24	27	29	32	38	35	42	48	62

12. ACS-NSTA Chemistry Test: 1960-61 Administration

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Part I	17	22	25	26	30	31	32	36	47	48
Part II	13	15	17	18	23	24	25	31	45	46
Total	--	36	40	44	54	56	62	69	93	95

13. ACS-NSTA Chemistry Test: 1961-62 Administration

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Part I	7	10	13	16	20	23	27	31	37	50
Part II	5	9	12	15	18	21	25	30	36	48
Total	13	19	26	32	38	44	52	61	73	97

14. ACS-NSTA Chemistry Test: 1962-63 Administration

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Part I	5	8	11	14	15	18	20	24	30	49
Part II	4	7	9	11	12	15	13	22	27	50
Total	12	17	21	25	28	33	37	44	56	99

15. Tests for General Physical Science: 1960-61 Administration

Lowest Score at Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Total	9	11	12	13	14	15	16	18	22	36

16. Tests for General Physical Science: 1961-62 and 1962-63 Administration

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Total	27	31	34	36	40	42	45	49	56	84

17. Earth Science - Biology Test

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Total	11	13	14	15	16	17	18	19	21	24

18. Earth Science Test

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Total	42	46	50	52	56	60	64	67	72	83

19. SRA Achievement Series: Arithmetic (1957-58 Administration)

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Reasoning	13	15	18	20	22	25	28	31	35	43
Concepts	10	12	14	16	18	19	21	23	26	32
Computation	16	20	23	26	29	32	34	37	40	46

20. SRA Achievement Series: Arithmetic: (1958-59 Administration)

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Reasoning	15	19	22	25	27	30	33	36	40	46
Concepts	12	15	17	19	21	22	24	26	29	34
Computation	18	24	28	31	34	36	39	41	44	48

21. SRA Achievement Series: Arithmetic (1959-60 Administration)

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Reasoning	18	22	25	28	31	34	36	39	42	47
Concepts	14	17	19	21	23	25	26	28	30	34
Computation	22	27	31	34	37	59	41	44	46	49

22. SRA Achievement Series: Science (1957-58 Administration)

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Part I	24	29	32	35	39	42	46	51	57	100
Part II	6	8	9	10	11	12	13	15	17	26

23. SRA Achievement Series: Science (1958-59 Administration)

Lowest Score At Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Part I	30	36	41	44	48	53	58	63	72	99
Part II (long)	10	13	14	16	18	19	21	23	26	36
Part II (short)	7	8	10	11	13	14	15	17	19	27

24. SRA Achievement Series: Science (1959-60 Administration)

Lowest Score at Percentile	Percentile									
	10	20	30	40	50	60	70	80	90	99+
Part I	34	41	46	51	55	60	66	72	80	103
Part II	10	13	15	17	19	21	23	25	28	39

It is hoped that this information is self-explanatory, and that you are able to interpret your pattern of scores. If we can answer any further questions you may have, please feel free to write me at Western Michigan University, Kalamazoo, Michigan.

Meanwhile, we again appreciate your continued cooperation in the extension of this important study. We will be greatly appreciative if you will return the enclosed postcard, indicating your current address, as soon as possible.

George G. Mallinson, Director

APPENDIX B

Letter of Agreement

This Letter of Agreement affirms a cooperative activity between Dr. George G. Mallinson, Dean, School of Graduate Studies, Western Michigan University, and principal investigator of the project supported by Cooperative Research Project No. 1941, herein after referred to as Science Motivation Project II, and the person whose name and address appear in the spaces below. Science Motivation Project II is a continuation of Science Motivation Project I supported by Cooperative Research Grant No. 503, which included many of the students who entered the 7th grade of **Wilmington-Lorenzo Public Schools** in the Fall of 1957.

Science Motivation Project I, which is terminating in August 1963, was designed to determine the influences of various factors on the science interests and achievements of students from twelve participating schools. In Science Motivation Project II the students now in the senior classes of these participating schools are requested to continue participation during the next four (4) years in the extended investigation. Such participation will involve the following:

1. The expressed willingness of the student, and parent or guardian, for the Principal Investigator to obtain annually, from any educational institution in which the student may enroll during the years 1963 through 1968, copies of the transcripts of his academic record. **The information obtained from these transcripts will be kept strictly confidential, as with the information obtained for Science Motivation Project I.**

   These transcripts will be obtained without cost or effort to the student.

2. The student is requested to agree tentatively to respond to a form of the **Kuder Preference Record** at the end of the academic years 1965 and 1967 and to brief questionnaires at the end of the academic years 1966 and 1968.

The willingness of the student, at this time, is indicated by the entry of appropriate information in the spaces below and by his signature in the apropriate blank.

The approval of the parent or guardian for the participation of the student is indicated in the spaces below the student's signature. The student, or parent or guardian, may withdraw permission at any future date without prejudice.

(PLEASE PRINT ITEMS A, B, C AND D IN PENCIL)

A. Name of Student ______________________________
(First) (Full Middle Name) (Last)

B. Present Street Address ______________________________

C. City and State ______________________________

D. Name of Parent or Guardian ______________________________
(First) (Middle) (Last)

Signature of Student (IN PENCIL) ______________________________

I hereby approve of the student's participation in Science Motivation Project II as described above.

(PLEASE SIGN IN PENCIL)

Signature of Parent ______________________________

August 11, 1967

Dear Participant:

A check of our records indicates that we have a returned postcard from you some time ago, stating that you have attended a college or university. A copy of this postcard is enclosed for your reference.

In order that we may bring our records up to date, we are wondering if you would please fill out and return in the enclosed self-addressed envelope the questionnaires that are attached.

Your cooperation will be greatly appreciated.

Sincerely,

Carol Jordan

(Mrs.) Carol S. Jordan
Secretary to the Director
Science Motivation Projects

cj

Enclosures

Please return in the enclosed envelope to:
Dr. George G. Mallinson, Director
Science Motivation Project II
School of Graduate Studies
Western Michigan University
Kalamazoo, Michigan 49001

EXPERIENCES OF PARTICIPANTS IN SCIENCE MOTIVATION PROJECT II DURING 1965-66 AND 1966-67

Please respond in the appropriate manner to all the items on these sheets. Your cooperation is sincerely appreciated.

I. Activities during 1965-66:

a. During 1965-66 I was engaged in the following activities. (Check the ones that are appropriate):

1. Full-time college student . . ____
2. Full-time student in a non-college program . . . . . ____
3. Part-time student . . . . . . ____
4. Employed . . ____
5. In military service . . . ____
6. Other . . . . ____

b. If you were in college, or in some other educational program, please list the name and location of the institution in the following blanks:

Name ______________________________

Location ______________________________

c. The program in which I was enrolled was the following. (Describe briefly, such as business administration, chemistry, elementary education, etc.):

____

II. Activities during 1966-67:

a. During 1966-67 I was engaged in the following activities:

1. Full-time college student . . ____
2. Full-time student in a non-college program . . . . . ____
3. Part-time student . . . . . . ____
4. Employed . . ____
5. In military service . . . ____
6. Other . . . . ____

b. If you were in college, or in some other educational program, please list the name and location of the institution in the following blanks:

Name ______________________________

Location ______________________________

c. The program in which I was enrolled was the following:

____

III. Support in college or other education:

a. My financial support in 1965-66 came from these sources: (Note: Put two marks (XX) for the main source of support and one mark (X) for other sources that were substantial):

Parents and relatives . _____

Scholarships and similar aid . . . _____

Self employment . . . . _____

Other . . . . _____

b. My financial support in 1966-67 came from these sources:

Parents and relatives . _____

Scholarships and similar aid . . . _____

Self employment . . . . _____

Other . . . . _____

IV. My tentative plans for 1967-68 are as follows:

____

____

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____

V. Comments and miscellaneous:

In the space below, please list any other information that you may think pertinent (no obligation), such as outside activities, satisfaction with school or employment or questions you have about your data. (This information will be kept 100% confidential.)

Thanks again for your assistance!

George G. Mallinson, Director
Science Motivation Project II

P.S. Will you please complete the following for our records.

My address for the Summer 1967 is likely to be the following:

Please return in the enclosed
self-addressed envelope to
Dr. George G. Mallinson, Dean
School of Graduate Studies
Western Michigan University
Kalamazoo, Michigan 49001

School system ____________________________

SCIENCE MOTIVATION PROJECT V

1. Recognizing that no commitments are involved, the personnel in our school system would be willing to discuss Science Motivation Project V, a repeat of Science Motivation Project I with you.

Yes __________ No __________

2. If the answer to 1 above is "Yes," the person to be contacted about such a conference is the following:

____

____

____

Signed: ______________________________

APPENDIX C

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECT II

KALAMAZOO, MICHIGAN
49001

You no doubt know that your has been a participant in Science Motivation Project I in which High School has participated with Western Michigan University since 1957. We have gathered much data during the past six years under a grant from the Federal government. These data have been extremely valuable in making projections of the manpower supply in the United States through 1985. The study has been discussed on several occasions with the students in the participating schools, and we have attempted to keep everyone informed about our efforts.

The data obtained from the Science Motivation Project have been sufficiently useful to warrant a four-year extension of the study in an effort to determine what happens to these students after they leave high school. The four-year extension is referred to as Science Motivation Project II. On February 21, 1963, a grant of $45,000 for Science Motivation Project II was announced officially in a release from the Department of Health, Education, and Welfare, a copy of which is enclosed for your information. A recent visit to your school system, as well as to the other school systems in the Project, was made in a personal effort to seek the cooperation of the students during the next four years.

When the matter was discussed with the students in your school system, we informed them that a copy of the Letter of Agreement that they would be asked to sign, indicating their tentative willingness to participate during the next four years, would be sent to the parents for approval. A copy of the Letter of Agreement is enclosed with a self-addressed envelope in the hopes that you will be willing to give approval for the continued participation of your family.

There are several points we should like to make clear:

1. The information we hope to collect during the next four years is merely an extension of the information that we have already obtained during Science Motivation Project I.

2. We are interested in working with all students, whether you enroll in advanced education or whether you enter occupational fields when you leave high school. We are also interested in working with all students, even if they have only participated in Science Motivation Project I for one year.

3. We want to make clear that no student is obligated in any way whatsoever to participate. However, it is our sincere hope that each one of you will be willing to give tentative agreement so we may have complete data.

The Letter of Agreement that is enclosed describes the conditions of our plan. Perhaps these conditions should be emphasized here.

1. We have no intention whatsoever of obtaining information about any student during the next four years unless both the student and parent or guardian are willing to let us have that information. We could probably obtain the information without this effort, but we are convinced this is an unwarranted invasion of your privacy.

2. If you are willing to sign the Letter of Agreement under the conditions stated, you may revoke that agreement at any time you wish. You will be contacted by me each year to determine whether you wish to continue.

3. All data that are collected during the next four years will be kept confidential as have the data during Science Motivation Project I.

If you see fit to express your willingness to participate, please sign the Letter and return it to me in the enclosed self-addressed envelope. Your signature should be made in pencil in order to make the best reproduction.

Whatever your decision may be in the matter, I want to thank you for personally reading this letter. I hope sincerely that you will agree at least tentatively to the continued participation. Should you have any additional questions, do not hesitate to contact me.

Sincerely,

George G. Mallinson
Dean and Director
Science Motivation Projects I and II

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Enclosures

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Office of Education
Washington 25, D.C.

FOR RELEASE IN A.M. PAPERS HEW-W65
Thursday, February 21, 1963

The U. S. Office of Education has signed contracts with two universities for research to determine what characteristics of high school courses in science and English serve to improve the performance of students in these subjects when they get to college.

Commissioner Francis Keppel said that the Office of Education has awarded a contract for $119,500 to the University of Illinois, Urbana, Ill., for a study to determine the type of high school program which seems most likely to insure a student's success in College English. The study, which will be directed by Dr. James R. Squire, Associate Professor of English at the University, is to be concluded by September 1, 1965.

In addition, Commissioner Keppel said, a $43,000 contract has been negotiated with Western Michigan University, Kalamazoo, Mich., for a similar study in science. This contract expires on January 1, 1968. It will be directed by Dr. George G. Mallinson, Dean, School of Graduate Studies at Western Michigan.

The University of Illinois, the Commissioner explained, will select 50 public and private high schools from a group of 76 in 34 States whose students have consistently won honors in English in the competition conducted annually by the National Council of Teachers of English at Urbana.

(More)

In selecting the 50 schools, the University of Illinois will also take into account the size of the student body, the economic backgrounds of the students, whether the school is public or private, whether it is in a rural or urban locality, and the extent to which it received financial support from the citizens of its community.

The University will select another 50 schools whose students have attained little distinction in English. The English courses and English instructional methods used in the two groups of schools will be compared.

The Western Michigan project in the field of science will involve a study of about 1,000 public high school students from Rockford, Kankakee, and Wilmington, Ill.; Angola, Elkhart and Kendallville, Ind.; Archbold and Bryan, Ohio; and Marshall, Quincy and Kalamazoo, Mich. The students included in the study will be selected from among those who plan to enter college this fall after extensive work in science.

By questionnaire and interview, it is planned to follow the career of these students during the four school years, 1963-1967, they would normally spend in college. The students will be checked from time to time to determine whether they are dropping, continuing, or expanding their work in science, and the reasons for their actions.

In addition to information about their high school courses, data will also be obtained on their plans for work after college and the methods by which they are supporting themselves while in college. This is to determine under what conditions students with an initial interest in science are likely to continue their interest through their college years and after graduation.

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECT II

KALAMAZOO, MICHIGAN
49001

We are now in the process of completing our filing system for the students who participated in the Science Motivation Project in the various high schools in Illinois, Indiana, Ohio, and Michigan during the past six years. Our records indicate that the vast majority of Letters of Agreement which were sent to the parents in the hopes of obtaining their signatures have been returned and Science Motivation Project II is underway. The records indicate, however, that the Letter of Agreement for your son or daughter has not yet been received.

It is highly possible that the Letter may have been lost either direction in the mail or that for some eminently justifiable reason it has not been returned with your signature.

Because of the investment in monies made by the Federal government, we are extremely anxious to obtain as many Letters of Agreement to participate in the Project as we possibly can.

We are sending you this follow-up letter, together with a reproduced copy of the Letter of Agreement and copies of our earlier correspondence, in the hope that it may still be possible for your family to participate with the many others.

I again want to make absolutely clear that there is no obligation or requirement on the part of your family to participate. However, the analyses we have already made have revealed significant information about the science program in the United States of which these schools are representative. Also, the analyses we are making of the records of the individual students, and which will be available to them shortly without charge, will prove eminently valuable to them, we are sure. We are, therefore, requesting from you, if at all possible, the return of this reproduced Letter of Agreement with your signature. We trust that you may see fit to continue in the effort.

Sincerely,

George G. Mallinson
Dean and Director
Science Motivation Project II

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Enclosures

APPENDIX D

WESTERN MICHIGAN UNIVERSITY

KALAMAZOO, MICHIGAN
49001

Science Motivation Project II is now approaching the end of its third year, and the data we have accumulated is being added to those data which were collected on the participants during the years 1957-1965. We have kept records, as accurately as possible, on all participants who have attended institutions of higher education of one variety or another, provided they chose to have us do so. Although we have been able to have personal contact with only a few participants so far, we have been extremely gratified with the willingness of these persons to cooperate.

During the first year of the Project, the participants completed the Kuder Preference Record, on which we made analyses, and for most of the participants we have obtained transcripts indicating the college programs in which they have been enrolled. Last year we asked the participants to complete questionnaires concerning their activities. For some unknown reason, we do not have a questionnaire from you in our files. Therefore, I am enclosing a copy of the questionnaire, which we sincerely hope you will see fit to fill out and return in the enclosed envelope. I may point out that all information will be kept strictly confidential and will not be disseminated outside of this office.

This year we are again administering the Kuder Preference Record. No doubt by this time you have received a copy of the Record with a request that you take the test and return it. We sincerely hope you will be willing to comply. All these scores and analyses of the data will be provided to you at your request.

Again I want to express my sincere appreciation to you for Western Michigan University and for the United States Office of Education for your valuable assistance. May I say that your cooperation in returning the questionnaire will be greatly appreciated.

Sincerely,

George G Mallinson

George G. Mallinson
Dean and Director
Science Motivation Project II

GGM:pfm
Enclosures

WESTERN MICHIGAN UNIVERSITY
SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECTS II & III

KALAMAZOO, MICHIGAN
49001

October 15, 1967

I doubt it is necessary for me to discuss the various Science Motivation Projects in which you have participated, since I am sure that the voluminous correspondence you have received has kept you fairly well informed. We are, however, in the process at this time of completing our activity on Science Motivation Project II and, hopefully, will be initiating Science Motivation Project IV next year in which you may be participating.

You may recall that during Science Motivation Project II we carried out three major activities, namely, the following:

1. For those students in Science Motivation Project I who went to college, we obtained the transcripts to identify the courses in science or mathematics in which they might have enrolled. Grades were not a concern to us.

2. During the freshman and junior years, we sent to each student a copy of the Kuder Preference Record and requested that he take this "test" and return it to us.

3. During the sophomore and senior years, we sent a survey form to every student concerning his collegiate activity.

In making our final compilation of data prior to final computer analysis, we fail to find that a Kuder Preference Record is on file for you for your junior year. It is still not too late to collect these data, if you are willing.

On the assumption that you may be willing to assist us with this final piece of data, we are enclosing the test materials, which are self-explanatory, plus a return envelope in which the test can be returned in the event you complete it. Believe me, we do appreciate what you have done and hope you will assist us in this close-out effort.

Sincerely,

George G. Mallinson, Director
Science Motivation Projects

GGM/cj
Enclosures

WESTERN MICHIGAN UNIVERSITY
SCHOOL OF GRADUATE STUDIES
KALAMAZOO, MICHIGAN
49001

Science Motivation Project II is now approaching the end of its second year, and the data we have accumulated is being added to those data which were collected on the participants during the years 1957-63. We have kept records, as accurately as possible, on all participants who have attended institutions of higher education of one variety or another, provided they chose to have us do so. Although we have been able to have personal contact with only a few participants so far, we have been extremely gratified with the willingness of these persons to cooperate.

Last year the participants completed the *Kuder Preference Record*, on which we made analyses, and for most of the participants we have obtained transcripts indicating the programs in which they have been enrolled. All that information is now being processed on the IBM 1620 Computer System at Western Michigan University. Analyses of these data as they may be related to the scores students obtained in participation in Science Motivation Project I will be available shortly and will be sent to all persons who are interested. I am enclosing a sheet on which you may indicate your desire to have copies of the analyses sent you when they are available.

You may recall when we first mentioned the possibility of your participation, that during the second year of the activity, we were planning to ask you to respond to a questionnaire about your activities. That questionnaire is enclosed with this letter together with a stamped self-addressed envelope for your reply. We hope sincerely that you will see fit to continue your participation as you have done in the past. I may point out that we are expecting to visit a number of students in the coming year to obtain data which are much more extensive than those we are collecting now. We hope you may be interested if asked to participate in that phase of the project also.

Again I want to express my sincere appreciation to you for Western Michigan University and for the Cooperative Research Branch of the U. S. Office of Education for your valuable assistance. May I say that your cooperation in returning the questionnaire will be greatly appreciated.

Sincerely,

George G. Mallinson
Dean and Director
Science Motivation Project II

GGM:pfm
Enclosures

Please return as soon as possible to:

Dr. George G. Mallinson, Director
Science Motivation Project II
School of Graduate Studies
Western Michigan University
Kalamazoo, Michigan 49001

Please fill out appropriately:

1. I would like to receive an analysis of the data collected during Science Motivation Project II as they may be related to those collected during Science Motivation Project I:

   Yes ______ No ______

2. If the analyses are sent between November 15 and January 1, they should be sent to the following address:

   ____

   ____

   ____

3. If they are sent after January 1, they should be sent to the following address:

   ____

   ____

   ____

4. I would be willing to be interviewed if the opportunity arises:

   Yes _____ No _____

5. Comments:

____

____

____

____

Signed ______________________________

Please return in the enclosed envelope to:

Dr. George G. Mallinson, Director
Science Motivation Project II
School of Graduate Studies
Western Michigan University
Kalamazoo, Michigan 49001

EXPERIENCES OF PARTICIPANTS IN SCIENCE MOTIVATION PROJECT II DURING 1963-64, 1964-65

Please respond in the appropriate manner to all the items on these sheets. Your cooperation is sincerely appreciated.

I. Activities during 1963-64:

a. During 1963-64 I was engaged in the following activities. (Check the ones that are appropriate):

1. Full-time college student . . ______
2. Full-time student in a non-college program . . . . . ______
3. Part-time student . . . . . . ______
4. Employed . . . . ______
5. In military service . . . . ______
6. Other . . . . . ______

b. If you were in college or in some other educational program, please list the name and location of the institution in the following blanks:

Name ______________________________________

Location ______________________________________

c. The program in which I was enrolled was the following. (Describe briefly, such as business administration, chemistry, elementary education, etc.):

____

II. Activities during 1964-65:

a. During 1964-65 I was engaged in the following activities:

1. Full-time college student . . ______
2. Full-time student in a non-college program . . . . . ______
3. Part-time student . . . . . . ______
4. Employed . . . . ______
5. In military service . . . . ______
6. Other . . . . . ______

b. If you were in college or in some other educational program, please list the name and location of the institution in the following blanks:

Name ______________________________________

Location ______________________________________

c. The program in which I was enrolled was the following:

____

III. Activities during 1965-66:

a. During 1965-66 I expect to be doing the following:

1. Full-time college student . . _____
2. Full-time student in a non-college program . . . . . _____
3. Part-time student . . . . . . _____
4. Employed . . . . _____
5. In military service . . . . _____
6. Other . . . . . . _____

b. If you will be in college or in some other educational program, please list the name and location of the institution in the following blanks:

Name ____

Location ____

c. The program in which I expect to be enrolled is the following:

____

IV. Support in college or other education:

a. My financial support in 1963-64 and 1964-65 came from these sources: (Note: put two marks (XX) for the main source of support and one mark (X) for other sources that were substantial):

Parents and relatives . . ______

Self employment . . . . . ______

Scholarships and similar aid . . . . . . ______

Other . . . . ______

b. I expect my financial support in 1965-66 will come from:

Parents and relatives . . ______

Self employment . . . . . ______

Scholarships and similar aid . . . . . . ______

Other . . . . ______

V. Comments and Miscellaneous:

In the space below, please list any other information that you may think pertinent (no obligation), such as outside activities, satisfaction with school or employment or questions you have about your data. (This information will be kept 100% confidential.)

Thanks again for your assistance!

George G. Mallinson, Director
Science Motivation Project II

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES

Science Motivation Project II

KALAMAZOO, MICHIGAN
49001

May 10, 1967

Dear Student:

Science Motivation Project II is now in its last year and the data that have been, and are being, accumulated are being added to that already collected when all of you were part of Science Motivation Project I from 1957 to 1963. At this time I want to again thank you sincerely for the time and effort you have contributed over the years to these worthy Projects. I hope sincerely that you will continue with us in Science Motivation Project IV which will deal with your activities at the post-baccalaureate level.

The last activity of Science Motivation Project II, as described to you earlier, is the completion of a survey form covering your activities from 1965-66 and 1966-67. I am enclosing that form and a self-addressed envelope to the last address we have for you. I hope sincerely that when this material arrives, you will see fit to respond to it as soon as possible and return it to us. We will then continue our analyses and, hopefully, will have a report available early in the fall. At that time you will receive a complete analysis of the results as you did for Science Motivation Project I.

Again, I want to express my sincere appreciation to you for Western Michigan University and for the U.S. Office of Education for your continued assistance in these Projects. Without your help, we could not possibly have gone as far as we have.

Sincerely,

George G. Mallinson
Dean and Director
Science Motivation Projects

GGM/cj

Enclosure

Please return in the enclosed envelope to:

Dr. George G. Mallinson, Director
Science Motivation Project II
School of Graduate Studies
Western Michigan University
Kalamazoo, Michigan 49001

EXPERIENCES OF PARTICIPANTS IN SCIENCE MOTIVATION PROJECT II DURING 1963-64, 1964-65 AND 1965-66

Please respond in the appropriate manner to all the items on these sheets. Your cooperation is sincerely appreciated.

I. Activities during 1963-64:

a. During 1963-64 I was engaged in the following activities. (Check the ones that are appropriate):

1. Full-time college student . . ______
2. Full-time student in a non-college program . . . . . ______
3. Part-time student . . . . . . ______
4. Employed . . . . ______
5. In military service . . . . ______
6. Other . . . . . ______

b. If you were in college or in some other educational program, please list the name and location of the institution in the following blanks:

Name ______________________________

Location ______________________________

c. The program in which I was enrolled was the following. (Describe briefly, such as business administration, chemistry, elementary education, etc.):

____

II. Activities during 1964-65:

a. During 1964-65 I was engaged in the following activities:

1. Full-time college student . . ______
2. Full-time student in a non-college program . . . . . ______
3. Part-time student . . . . . . ______
4. Employed . . . . ______
5. In military service . . . . ______
6. Other . . . . . ______

b. If you were in college or in some other educational program, please list the name and location of the institution in the following blanks:

Name ______________________________

Location ______________________________

c. The program in which I was enrolled was the following:

____

III. Activities during 1965-66:

a. During 1965-66 I was engaged in the following activities:

1. Full-time college student . . _____	4. Employed . . . . _____
2. Full-time student in a non-college program . . . . . _____	5. In military service . . . . _____
3. Part-time student . . . . . . _____	6. Other . . . . . _____

b. If you were in college or in some other educational program, please list the name and location of the institution in the following blanks:

Name ____________________________________

Location __________________________________

c. The program in which I was enrolled was the following:

____

IV. Support in college or other education:

a. My financial support in 1963-64 and 1964-65 came from these sources: (Note: put two marks (XX) for the main source of support and one mark (X) for other sources that were substantial):

Parents and relatives . . _____	Scholarships and similar aid . . . . . . _____
Self employment . . . . . _____	Other . . . . _____

b. My financial support in 1965-66 came from these sources:

Parents and relatives . . _____	Scholarships and similar aid . . . . . . _____
Self employment . . . . . _____	Other . . . . _____

V. Comments and Miscellaneous:

In the space below, please list any other information that you may think pertinent (no obligation), such as outside activities, satisfaction with school or employment or questions you have about your data. (This information will be kept 100% confidential.)

Thanks again for your assistance!

George G. Mallinson, Director
Science Motivation Project II

Please return to:

Dr. George G. Mallinson, Dean
School of Graduate Studies
Western Michigan University
Kalamazoo, Michigan 49001

SOURCE OF FELLOWSHIP SUPPORT IN COLLEGE

Will you please provide any information you may have concerning the source of funds from which you received a scholarship, fellowship, or assistantship while in college.

1. a) Many students in college received fellowship support from State funds. If you received support from State (public) funds, will you please indicate in the space below the name of the program from which such support was received:

____

____

b) In which years did you receive this support?

1963-64 _____ 1965-66 _____ 1967-68 _____

1964-65 _____ 1966-67 _____

2. a) Some students received support from private funds such as Woodrow Wilson, National Merit, or Danforth. If you received support from any of these or other private sources, please indicate below.

____

____

b) In which years did you receive such support?

1963-64 _____ 1965-66 _____ 1967-68 _____

1964-65 _____ 1966-67 _____

SOURCE OF FELLOWSHIP SUPPORT IN COLLEGE

3. a) Some students received support from Federal funds. If you received such support, will you please indicate in the space below the name of the program from which such support was received.

____

____

b) In which years did you receive such support?

1963-64 _____ 1965-66 _____ 1967-68 _____

1964-65 _____ 1966-67 _____

4. If you received monetary support from sources other than those listed above, please list in the space below.

____

____

APPENDIX E

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECT II

KALAMAZOO, MICHIGAN
49001

February 15, 1965

I have a rather unusual request with which you may provide me assistance. Beginning in May 1957, with support of the Cooperative Research Branch, Office of Education, United States Government, I have been conducting a study in which the progress of several thousand high school students has been traced. The study began with the testing of these students when they were in the seventh grade and continued through the graduation date from high school in June of 1963. That study was called Science Motivation Project I.

I have now been asked to find out what has become of these students. Some have gone to college; others have gone to trade schools; and many have jobs or are in military service. We are interested in learning about their progress without regard for their graduation from high school or present activity.

As you might guess, it is a difficult task to find the present addresses of all these students. We have located most of them, but some are still "unknown". Hence, we are writing to you for assistance.

Your community of   is one that was involved in our original study. Included in the group was a student with the same last name as yours. All these students would now be between the ages of about 17-21. Since your name and address appear in the telephone directory for   , it is possible that you may be related to, or know, the person whose name is listed below. If so, and if you know the present address of the student, we would very much appreciate receiving it. You may reply on the enclosed stamped postcard.

We know there are many groups that use letters such as these for sales or advertising purposes. This, of course, is not the case here. Consequently, we shall be more than pleased to provide you any information about the support of this study by the U.S. Government.

Any assistance you may provide will be sincerely appreciated.

Very truly yours,

George G. Mallinson, Dean
School of Graduate Studies
and
Director, SMP I and II

GGM/mf

Enclosure

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECT II

KALAMAZOO, MICHIGAN
49001

As you know, we have written you and your former classmates many times during the past six or seven years concerning Science Motivation Projects I, II and III. None of you have participated in all of these Projects, although most of you have participated in Science Motivation Project I, and either Science Motivation Project II or III. In order to refresh your mind, I am listing below some of the purposes behind each of these Projects:

1. Science Motivation Project I

   In this Project we worked with you and your school system from 1957 to 1963. During that period we measured some of the results of some of your accomplishments in the science and mathematics programs in your public schools. A report was prepared on this Project some time ago.

2. Science Motivation Project II

   In this Project we are working with those persons who, on leaving school, entered college. We are trying to determine how their present studies may be related to their interests and the courses they took in high school.

3. Science Motivation Project III

   In this Project, we are working with those students who, on leaving school, entered occupations or activities other than college. We are trying to learn how well the programs in the public schools have served them.

To those of you who are in college and who are participating in Science Motivation Project II, I would like to state that you will be hearing from us soon concerning the Kuder Preference Record, which we hope you will be taking in late April. You will recall that two years ago, you took this particular interest test. Last year you filled out a blank concerning your work in college. We certainly want to thank you for your cooperation.

A few weeks ago we sent a letter to most of you who entered occupations or other activities. The letter stated that we hoped to interview some of you within the next six months. During the interview, we hope to find out how well your school program helped you. We were quite surprised at the great number of replies that we received almost immediately. We did not expect that so many people would express their interest in working with us. Therefore, we are planning in the very near future to visit your community and telephone some of you about the possibility of an interview. It may be that you have not yet returned the letter indicating your interest for an interview. Perhaps, with a change in address, the letter did not reach you. You may be one of those called, even if you original letter has not been received.

As you know, the United States Office of Education has over $100,000 invested in these Projects and is extremely interested in the kinds of information you have been providing. Thanks again for your contributions.

Sincerely,

George G. Mallinson
Dean and Director
Science Motivation Projects

GGM:pfm

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECT II

KALAMAZOO, MICHIGAN
49001

October 30, 1965

Dear Student:

A short time ago when you returned the questionnaire concerning your college activities, you noted that your fall address would be as shown on the enclosed postcard. In order to verify our records, we are sending you this letter and hope you will respond by checking the information.

Again, we are extremely pleased with the fine response from those who have participated in Science Motivation Projects I and II and hope that the cooperation we have received so far will continue.

Will you please return the enclosed postcard with the appropriate information. You will be hearing from us again about the Project in the near future.

Sincerely,

George G. Mallinson
Dean and Director
Science Motivation Projects I and II

GGM:pfm
Enclosure

APPENDIX F

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECTS II & III

KALAMAZOO, MICHIGAN
49001

Dear Sir:

In 1957, with support from the Cooperative Research Branch, U.S. Office of Education, the School of Graduate Studies, Western Michigan University, began a study to investigate certain factors related to the interest, motivation, and achievement of high-school students in science and mathematics. The study involved approximately 2,500 students in 13 school systems in the States of Michigan, Indiana, Illinois, and Ohio. These students were studied from the time they entered the 7th grade through graduation from high school in the spring of 1963. The study is known as Science Motivation Project I.

Upon termination of Science Motivation Project I, it was suggested that the progress of those students who entered institutions of higher education should be traced in the hopes of finding relationships between the high-school data and their achievement and activities in college. This study, known as Science Motivation Project II, received support as Project No. 1941 from the Cooperative Research Branch.

Some of the participants in Science Motivation Project I have enrolled in your institution as freshmen since graduation from high school or have transferred there during their undergraduate years. A list of the names and home addresses of these students is attached. In order to continue the study, it was obvious that it would be necessary to obtain copies of the transcript of credits of each of these students. However, the rights of the student and the parent to reject a request for the transcript were recognized. Hence, all students in the original study were asked to sign a "Letter of Agreement" in the Spring 1963 to participate in the second phase, Science Motivation Project II, including the request for transcripts. Realizing the students were minors at the time, the letter signed by the student was sent to the parent for further approval. A blank copy of the "Letter of Agreement" is attached.

The students listed on the attached sheet are those for whom completed "Letters of Agreement" are in our files. Included, however, is a list only of the names and addresses, since we wish to avoid complicated paperwork. However, copies of all the Letters of Agreement will be sent to you if you so request. Also, any other validation of the study will be cheerfully provided.

On the assumption that this procedure may prove satisfactory, and that transcripts cost $1.00 each, we are enclosing a check for what seems to be the appropriate amount. If an additional amount is required, we will forward a check to you immediately.

Any assistance you may provide will be appreciated.

Sincerely,

George G. Mallinson

George G. Mallinson
Dean and Director
Science Motivation Projects

GGM/cj

Enclosures

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECT II

KALAMAZOO, MICHIGAN
49001

On February 15, 1965, a letter was sent to the Registrar of your institution requesting transcripts for participants in Science Motivation Project II, a study supported by the Cooperative Research Branch, U. S. Office of Education, now underway at Western Michigan University. A copy of that letter is enclosed for your reference, and specific details of the project are explained therein.

At the present time, we are in the process of updating our mailing list of students. We have had some success in locating students through agencies such as employment bureaus, high schools, and military recruiting stations, and we have been most grateful for the cooperation we have received thus far. However, we find that we have many students for whom we have college addresses but no home addresses. Letters sent to the college address are frequently returned.

Our records indicate that the student(s) listed below have been or are now enrolled in your institution, and we are therefore wondering if you might be able to send us the last home address you have for those listed. A self-addressed envelope is enclosed for your convenience of reply. We certainly will appreciate any help you may be able to provide us.

If you have any questions about the Project or desire furthur information, please do not hesitate to contact us. Such information will be cheerfully provided.

Sincerely,

George G. Mallinson, Director
Science Motivation Project II

GGM/ad
Enclosures--2

Student(s):

APPENDIX G

SCIENCE MOTIVATION PROJECT NEWSNOTES

SCHOOL OF GRADUATE STUDIES
WESTERN MICHIGAN UNIVERSITY, KALAMAZOO, MICHIGAN 49001 MARCH 1966

From time to time the Director of Science Motivation Projects I, II and III (usually referred to as "SMP I," "SMP II," and "SMP III") receives letters of inquiry from participants in the studies asking, "Just what is this all about?" or, "What have you found out from all the research?" Hence, we decided it might be interesting to you at this time to issue a brief newsletter listing some of the information that has been obtained from the study.

As you know from the enclosed letter, as well as from the correspondence you have received over the years, there have been three phases in this study. All these have been financed by grants of money from the U. S. Office of Education. SMP I began when you were a sixth-grader in elementary school. At that time we enlisted the aid of thirteen school systems in the Great Lakes region, some large; some small; some urban; some rural. From the time you were in seventh grade until your class graduated in June 1963, each year we tested, observed, and interviewed you and your teachers to learn about you as a group of students.

From the beginning, each of you was assigned a code number. Your school was also coded. These codes, together with all test scores, were entered on large roster sheets and later key punched into IBM cards for computer analysis. At this point it should be stressed that we were interested in an analysis of interest and achievement scores of the total group, not in analyzing you as individuals. Hence, names were never used in reporting results. In all, SMP I involved recording and analyzing about 2½ million scores, obtained from testing more than 6000 students during the six-year period.

The results of SMP I were submitted to the Office of Education in 1964. The final report was almost 200 pages in length, and obviously the findings are much too long to report here. However, here are some facts from the study that might interest you:

1. Achievement in science is only moderately related to mental ability (I.Q.), but it does appear to be related significantly to a student's reading ability and his interest in science.

2. One of the most significant factors related to a student's success in junior and senior high school is his belief that his parents are concerned about, and interested in, his education.

3. Achievement of students in science is related to how recently their science teacher was trained. That is, teachers who recently studied science at either the undergraduate or graduate level seem to do the best job.

(over)

4. The success of students has little relationship to the size of the school or the type of community in which the school is located.

* * *

SMP II, which is now in its third year, has been concerned with those students from SMP I who went to college. An attempt is being made to determine what factors are related to a student's success in the science courses he elects in college. Thus far, some preliminary results are these:

1. There is little relationship between a student's success in freshman science courses in college and his success in high school.

2. There is no relationship between a student's success in college and the size of the high school from which he graduated.

3. There is a definite relationship between success in college science and a student's interest in high school science.

(These findings are, of course, preliminary; no final conclusions can be drawn until SMP II terminates in 1967.)

* * *

SMP III is the newest of these studies. The grant for this study was awarded in October 1965 and involves those students from SMP I who did not go to college, but took up some other activity. One of the chief purposes of SMP III is to try to determine how well your junior high and high-school training prepared you for your present job or activity; and what changes, if any, might be made in junior- and senior-high-school programs to prepare students better for their future life.

As some of you know, some of you are now being interviewed for information for this phase of the study. As with all information collected since 1957, all information is confidential, and no person is identified by name.

* * *

It is hoped that these general "Newsnotes" are of some interest to you, and help to give you a better understanding of what the Projects are about. The Director is most appreciative of your continued cooperation in this project. If at any time we can give you more specific information as it relates to you personally, please feel free to write to me.

George G. Mallinson, Director
Science Motivation Projects

WESTERN MICHIGAN UNIVERSITY
SCHOOL OF GRADUATE STUDIES
Science Motivation Project II

KALAMAZOO, MICHIGAN
49001

TO: All of Those Who Have Participated and Are Now Participating in Science Motivation Projects I and II

MAY YOU HAVE A VERY PLEASANT HOLIDAY SEASON

George G. Mallinson, Director

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECTS II & III

KALAMAZOO, MICHIGAN
49001

August 4, 1967

Dear Participant:

Within recent weeks you have received a number of pieces of correspondence from me concerning your participation in the various Science Motivation Projects. Because of the number of communications I shall not attempt to refer specifically to them here, since some of these involve the return of separate sheets and others involve the return of postcards.

I have on my desk at the present time approximately 300 sheets and postcards, each of which requests some specific comment concerning participation. We are now in the process of gathering the data necessary for responding to these requests for information and will be working on this for several weeks. I am writing at this time to let you know that your response is not being disregarded; rather, it is necessary for us to sort through voluminous amounts of data to gather information on these comments.

You will be hearing from us shortly, and I trust that the response will come as rapidly as you wish. Again, I want to thank you sincerely for your efforts and let you know that your contributions have been most valuable to us.

Sincerely,

George G Mallinson

George G. Mallinson
Dean and Director
Science Motivation Projects

GGM/cj

P.S. This letter may be sent out while I am on a week's trip for the University. Consequently, I am asking my secretary to stamp my name. Ordinarily, I sign every letter personally that goes to everyone. However, in this case I wish to apologize if I do not sign this one.

G.G.M.

WESTERN MICHIGAN UNIVERSITY

SCHOOL OF GRADUATE STUDIES
SCIENCE MOTIVATION PROJECTS II & III

KALAMAZOO, MICHIGAN
49001

September 15, 1967

TO: Participants in Science Motivation Project II

RE: Unanswered Questions

FROM: Dr. George G. Mallinson, Director

Dear Colleagues:

Within the last few months, in response to our correspondence, many students in Science Motivation Project II have expressed a great deal of interest in having certain questions answered concerning the Project. In most cases the replies have required individualized letters of two to three pages in length. Although making such responses is extremely time-consuming, we are more than delighted to do so, and we are "chopping away at the pile."

You may be one of those who has already received a response but, to save time, it was easier to send all of those who requested information a letter to indicate that we are working on this and that you will be hearing from us as soon as possible.

Sincerely,

George G. Mallinson, Director
Science Motivation Projects

GGM/cj